



**NATIONAL OCCUPATIONAL  
STANDARD FOR STEEL FIXER**

## APPROVING AUTHORITY

This National Occupational Standard has been prepared and published under the authority of the Zambia Qualifications Authority Board on 25<sup>th</sup> 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
15. ZESCO Limited

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## TABLE OF CONTENTS

FOREWORD .....	iii
JUSTIFICATION.....	iii
ACRONYMS AND ABBREVIATIONS .....	iv
GLOSSARY OF TERMS .....	v
1. OVERVIEW .....	1
2. SCOPE .....	2
3. PERSONAL ATTRIBUTES (VALUES, ETHICS AND ATTITUDES).....	2
4. UNITS AND ELEMENTS .....	2
5. EQUIPMENT, TOOLS AND CONSUMABLE MATERIALS .....	22
6. DILEMMAS/CHALLENGES AND COMPLEXITIES FOR A JOB HOLDER .....	22
7. WORKING CONDITIONS/ENVIRONMENT .....	22
8. PARTIES INVOLVED/INTERACTING WITH THE JOB HOLDER OR TRAINEE 23	
9. PHYSICAL DEMANDS ON THE BODY .....	23
ANNEX A .....	24
ANNEX B .....	25

## 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

Steel Fixer is one of the critical trades in the construction industry which is common to all types of constructions. A Steel Fixer should be able to identify types and grades of steel bars suitable for different types of construction works, read drawings and prepare work schedules. The Steel Fixer carries out steel bar fabrication works using hand and power tools, stores, transports and fixes reinforcements in position in formwork, in readiness for concrete pours. The development of this National Occupational Standard will ensure relevance of the training to latest advancements in industry, resulting in adequately and appropriately skilled Steel Fixers.

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

## **ACRONYMS AND ABBREVIATIONS**

BBS	Bar Bending Schedule
CS	Core Skill
NOS	National Occupational Standard
NOSDT	National Occupational Standards Development Team
OK	Organisational Knowledge
PC	Performance Criteria
PS	Professional Skill
RPL	Recognition of Prior Learning
SF	Steel Fixer
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.

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

**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 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:** 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.



## 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.SF.01
<b>Occupation</b>	Bar Bending and Fixing
<b>Job Title</b>	Steel Fixer
<b>Job Description</b>	The Steel Fixer is responsible for interpreting of drawing and bending schedules marking, cutting and bending of steel bars using hand or power tools, as well as fabricating, placing and fixing steel reinforcements at desired locations
<b>Job Purpose</b>	A Steel Fixer performs interpreting of drawings and bar bending schedules, cutting, bending, fabrication and fixing of steel reinforcements as per drawings and construction work requirements compliant with applicable safety and technological/ quality standards
<b>ZQF Level</b>	3
<b>Sector</b>	Construction
<b>Sub sector</b>	Real Estate and Infrastructure Construction
<b>Other Economic Sector(s) in which the Occupation is Practiced</b>	Mining, Manufacturing, Telecommunication, Energy, Education/training, etc.
<b>Other Similar Jobs that can be Performed in the Occupation</b>	Form Work, Scaffolding, etc.
<b>Minimum Educational Job Entry Qualification(s)</b>	Senior Secondary Education Certificate
<b>Practicing License Requirements (if any)</b>	No. (But Membership with the Engineering Institution of Zambia is recommended).
<b>Training/RPL (Suggested)</b>	1. First aid on construction site 2. ICTS 3. Entrepreneurship
<b>Minimum Job Entry Age</b>	1. Apprenticeship – 16 years 2. Full employment – 18 years
<b>Prior Experience (Recommended)</b>	1. Non trained worker: 3 years site experience in the same occupation 2. Trained worker: 1 year site experience as an apprentice Steel Fixer
<b>Performance Criteria</b>	As described in the Units under Section 4

## **2. SCOPE**

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

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

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

## **4. UNITS AND ELEMENTS**

This National Occupational Standard is divided into 6 Units representing the tasks that a jobholder should undertake in his/her day-to-day work. 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 Steel Fixer to read and interpret routine drawings/ sketches and bar bending schedules].

<b>Unit No.</b>	<b>01</b>
<b>Unit Title</b>	<b>Read and interpret drawings/ sketches and bar bending schedules</b>
<b>Description</b>	This Unit describes the skills and knowledge required to read and interpret routine drawings/ sketches and bar bending schedules
<b>Scope</b>	This Unit covers the following: <ul style="list-style-type: none"> <li>• Read and interpret drawings/ sketches</li> <li>• Read and interpret bar bending schedules</li> </ul>
<b>Performance Criteria (PC) with respect to the Scope</b>	
<b>Element</b>	<b>Performance Criteria (PC)</b>
<b>Read and interpret routine drawings/ sketches</b>	To be competent, the individual must be able to: PC1. read and interpret details from sketches/ drawings PC2. understand fixing/insertion sequence from the drawings PC3. determine the direction and position of steel reinforcement bars from the drawing PC4. determine number of chairs/stools, spacer bars requirement to be used PC5. determine the size and type of cover block to be used from the drawing PC6. determine cutting length required for basic works from the sketches PC7. plan for cutting of steel reinforcement bars as per instructions
<b>Read and interpret bar bending schedules</b>	To be competent, the individual must be able to: PC8. read and interpret correct detail from bar bending schedule including types, diameter, shape, cutting length, number of steel reinforcement bars PC9. determine the cutting length of steel reinforcement bars from the provided bar bending schedule (BBS) PC10. understand terms used in bar bending schedules PC11. estimate quantities of work from bar bending schedule PC12. plan for cutting of steel reinforcement bars as per instructions, considering cutting length and minimum wastage
<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 for handling and storing relevant tools, equipment and materials OK2. standard procedures for fixing reinforcement OK3. personal protection including the use of safety gear and equipment OK4. precautions and measures required in the lifting and movement of heavy components and materials OK5. service request procedures for tools, materials and equipment OK6. daily inspection and service

<p><b>B. Technical Knowledge</b></p>	<p>The individual on the job must demonstrate knowledge and understanding of local construction codes and mandatory standards below:</p> <ul style="list-style-type: none"> <li>TK1. how to read and interpret drawing/sketches for bar bending and fixing works</li> <li>TK2. use of measurement and marking tools</li> <li>TK3. basic arithmetic calculations</li> <li>TK4. how to carry out simple measurements using metric and imperial systems</li> <li>TK5. how to read and interpret bar bending schedules</li> <li>TK6 identification of equipment and tools for the job</li> <li>TK7. conversion of linear units</li> <li>TK8. unit weight of steel</li> <li>TK9. different types of cover blocks and their uses</li> <li>TK10. how to prevent steel reinforcements from contamination/ corrosion</li> <li>TK11. different types of steel bars and rods, length and diameter</li> <li>TK12. different types of binding wire, thickness and uses</li> <li>TK13. mould forms and their specific requirements along with process/ procedure to be followed for precast reinforcement</li> <li>TK14. material properties of steel bars such as strength and hardness</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 be able to 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> </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>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</li> <li>CS4. read and interpret sketches, drawings or instructions provided for the required work</li> <li>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</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>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</li> <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>

<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. encourage a safe working environment for team members PS3. determine adequacy on manpower, tools, materials and equipment for a particular task
	<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. prioritise daily works as per the construction project requirements PS6. complete work as per agreed time schedule and quality PS7. own a personal tools box
	<b>Problem Solving</b>
	The individual on the job should be able to: PS8. resolve any conflicts within the team PS9. propose any problem related to fixing or insertion of steel reinforcements in congested areas PS10. resolve and rectify the problem upon approval by superiors
	<b>Analytical Thinking</b>
	The individual on the job should be able to: PS11. analyse and convey to the superior and carry out remedial action PS12. correlate the sequence of reinforcement works with respect to other proceeding activities of other teams at the site PS13. optimise resources relating to reinforcement works PS14. minimise resource wastage PS15. evaluate the complexity of the task and seek assistance and support whenever required PS16. analyse the performance of structural element in the process of next technological steps in work execution.
<b>Critical Thinking</b>	
The individual on the job should be able to: PS17. identify and deal with or report violation of any safety norms which may lead to accidents PS18. encourage incident reporting and regular risk assessment to support continual improvement in work processes.	

**UNIT 2** [This Unit covers the skills and knowledge required by a Steel Fixer to use hand and power tools to cut and bend steel reinforcement bars].

<b>Unit No.</b>	<b>02</b>
<b>Unit Title</b>	<b>Use hand and power tools to cut and bend steel reinforcement bars</b>
<b>Description</b>	This Unit describes the skills and knowledge required to use hand and power tools to cut and bend steel reinforcement bars
<b>Scope</b>	This Unit covers the following: <ul style="list-style-type: none"> <li>• Use hand and power tools to cut steel reinforcement bars</li> <li>• Use hand and power tools to bend steel reinforcement bars</li> </ul>
<b>Performance Criteria (PC) with respect to the Scope</b>	
<b>Element</b>	<b>Performance Criteria (PC)</b>
<b>Use hand and power tools to cut steel reinforcement bars</b>	To be competent, the individual should be able to: PC1. select hand/power tools for cutting steel reinforcement bars as per requirement/instruction PC2. select cutting blade for cutting of steel reinforcement bars as per requirement/instruction PC3. use measuring and marking tools to mark on steel reinforcement bars for cutting as per specified length in the bar bending schedule PC4. place steel reinforcement bars properly for cutting, as per requirement and instruction PC5. ensure adequate number of bars are placed for cutting to avoid damage to the machine PC6. maintain correct body posture in line with health and safety procedures while cutting steel reinforcement bars manually or mechanically PC7. tag and stack steel reinforcement bars after cutting as per standard practices
<b>Use hand and power tools to bend steel reinforcement bars</b>	To be competent, the individual should be able to: PC8. select hand/ power tools for bending steel reinforcement bars with respect to the work PC9. select appropriate tools and accessories for bending operations with respect to the diameter of steel reinforcement bars PC10. mark on steel reinforcement bars, place and fix them in correct position for bending PC11. maintain correct body posture in line with health and safety procedures in liaison with tools and equipment manufactures manuals while bending steel reinforcement bars manually or mechanically PC12. bend steel reinforcement bars as per the shape and dimensions given in the bar bending schedule, including hooks PC13. check the length and shape of steel reinforcement bars to ensure they are within the tolerance limits PC14. tag and stack steel reinforcement bars after bending as per standard practices

<b>Knowledge and Understanding (K)</b>	
<b>A. Organisational Context (Knowledge of the company/ organisation and its processes)</b>	The individual on the job should demonstrate knowledge and understanding of: OK1. standard procedures for reinforcement work OK2. safety rules and regulations for handling and storing relevant tools, equipment and materials for fabrication works OK3. personal protection including the correct use of safety gear and equipment OK4. precautions and measures required in the lifting and movement of heavy components and materials OK5. service request procedures for tools, materials and equipment OK6. daily inspection and service of tools and equipment
<b>B. Technical Knowledge</b>	The individual on the job should demonstrate knowledge and understanding of: TK1. safety measures applicable in the processes of steel reinforcement, bending and fixing for use of different types of hand and power tools TK2. different types of tools and accessories for cutting, bending and threading of steel reinforcement bars TK3. fix cutting blades and other accessories on cutting and bending machines TK4. capacity and other details of cutting, bending and threading machines required for the job TK5. use of Computer Numerical Control (CNC) machine for reinforcement works TK6. methods of protecting steel from contamination TK7. tolerance limits for bending and cutting of steel reinforcement bars TK8. tagging procedures for steel reinforcement bars based on shape, size and location TK9. use of measuring and marking tools TK10. basic arithmetic calculations TK11. carry out measurements using metric and imperial systems TK12. read and interpret bar bending schedules in order to carry out cutting and bending of steel reinforcement bars TK13. conversion of linear units TK14. unit weight of steel TK15. method and knowledge of storing cut steel reinforcement bars and scrap material TK16. bar bending yard as well as handling and storage of materials in the yard
<b>Skills (S)</b>	
<b>A. Core Skills/ Generic Skills</b>	<b>Writing Skills</b>
	The individual on the job should 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 co-workers

	<p><b>Reading Skills</b></p>
	<p>The individual on the job should be able to:            CS3. read bar bending schedules provided by the supervisor for placing and fixing of steel reinforcement bars            CS4. 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            CS5. read and interpret sketches, drawings or instructions provided for the required work            CS6. 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>
	<p><b>Oral Communication (Listening and Speaking skills)</b></p>
	<p>The individual on the job should be able to:            CS7. 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            CS8. listen attentively and interpret communication/instructions from the supervisor and other co-workers            CS9. convey information clearly and concisely to co-workers</p>
<p><b>B. Professional Skills</b></p>	<p><b>Decision Making</b></p>
	<p>The individual on the job should 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>
	<p><b>Plan and Organise</b></p>
	<p>The individual on the job should be able to:            PS3. plan work and organise required resources in coordination with team members and superiors            PS4. prioritise daily works as per the construction project requirements</p>
	<p><b>Customer Centricity</b></p>
	<p>The individual on the job should be able to:            PS6. complete work as per agreed time schedule and quality</p>
	<p><b>Problem Solving</b></p>
	<p>The individual on the job should be able to:            PS7. resolve any conflicts within the team            PS8. rectify any problem related to fixing or insertion of steel reinforcements in congested areas</p>
	<p><b>Analytical Thinking</b></p>
	<p>The individual on the job should be able to:            PS9. insert and fix steel reinforcement bars in complex structures            PS10. correlate the sequence of reinforcement works with respect to other proceeding activities of other teams at the site            PS11. optimise resources relating to reinforcement works            PS12. minimise material wastage</p>



	<p><b>Critical Thinking</b></p> <p>The individual on the job should be able to:</p> <ul style="list-style-type: none"><li>PS13. evaluate the complexity of the task and seek assistance and support whenever required</li><li>PS14. identify and deal with or report violation of any safety norms which may lead to accidents</li></ul>
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**UNIT 3** [This Unit covers the skills and knowledge required by a Steel Fixer to prepare, fabricate, place and fix steel reinforcements for Reinforced Cement Concrete (RCC) structures].

<b>Unit No.</b>	<b>03</b>
<b>Unit Title</b>	<b>Prepare, bend, place and fix steel reinforcements for Reinforced Cement Concrete (RCC) structures</b>
<b>Description</b>	This Unit describes the skills and knowledge required to prepare, bend, place and fix steel reinforcements for Reinforced Cement Concrete (RCC) structures as per bar bending schedule
<b>Scope</b>	This Unit covers the following: <ul style="list-style-type: none"> <li>Bend, place and fix steel reinforcements for Reinforced Cement Concrete (RCC) structures as per bar bending schedule and drawing</li> </ul>
<b>Performance Criteria (PC) with respect to the Scope</b>	
<b>Element</b>	<b>Performance Criteria (PC)</b>
<b>Fabricate, place and fix steel reinforcements for Reinforced Cement Concrete (RCC) structures as per bar bending schedule and drawing</b>	To be competent, the individual should be able to: <ul style="list-style-type: none"> <li>PC1. read and interpret relevant specifications given in the sketches/ drawings</li> <li>PC2. follow correct method for inserting/ fixing of steel reinforcement bars as per the type of structure</li> <li>PC3. select steel reinforcement bars for placement as per the drawing</li> <li>PC4. mark and place steel reinforcement bars, fabricate the cage and fix it in its position as per the drawing</li> <li>PC5. maintain uniform spacing between the bars, stirrups and link rods as per the drawing</li> <li>PC6. stagger the lap to avoid more than 50% of splicing</li> <li>PC7. place and fix mechanical coupler in case of higher diameter steel reinforcement bars</li> <li>PC8. tie reinforcements with approved binding wires as per drawing, with specified spacing</li> <li>PC9. ensure cover blocks and spacers are placed to maintain appropriate covers and spacing</li> <li>PC10. place and fix chairs at specified spacing to maintain correct thickness</li> <li>PC11. ensure that location and position of reinforcement and fixing ties to reinforcement are checked for accuracy</li> <li>PC12. follow sequence of tying as per method statement</li> <li>PC13. provide suitable stiffeners for lifting in case of prefabricated cages</li> <li>PC14. check quality of reinforcement work with reference to spacing and placement of steel reinforcement bars</li> <li>PC15. report to superiors for validation of work executed and take corrective action if any errors or issues are found</li> </ul>
<b>Knowledge and Understanding (K)</b>	
<b>A. Organisational Context (Knowledge of the</b>	The individual on the job should demonstrate knowledge and understanding of: <ul style="list-style-type: none"> <li>OK1. standard procedures for reinforcement work</li> </ul>

<p><b>company/ organisation and its processes)</b></p>	<p>OK2. safety rules and regulations for handling and storing relevant tools, equipment and materials for fabrication works OK3. personal protection including the use of safety gear and equipment OK4. precautions and measures required in the lifting and movement of heavy components and materials OK5. service request procedures for tools, materials and equipment OK6. maintenance of tools and equipment</p>
<p><b>B. Technical Knowledge</b></p>	<p>The individual on the job should demonstrate knowledge and understanding of:</p> <p>TK1. basic drawings/ sketches related to reinforcement work TK2. sequence for tying of reinforcement for in-situ and prefabrication works TK3. insertion and fixing process for slab, beam, column, footing, wall, staircase, etc. TK4. one way and two-way slabs TK5. prefabrication of reinforcement cages and their use in different types of structures TK6. lapping length and importance of lapping for different diameters of steel reinforcement bars TK7. different types of stirrups and ties used in bar bending works TK8. importance of clear cover while carrying out reinforcement works TK9. use of chairs, spacer bars and hanger bars TK10. use of mechanical coupler and threading of reinforcements TK11. standard tolerance levels in reinforcement works TK12. conversion of linear units TK13. check the quality of cutting blades by visual inspection TK14. check the quality of accessories which are used for cutting and bending of steel reinforcement bars TK15. electrical safety of power tools and equipment used in bar bending works TK16. different types of steel reinforcement bars TK17. different types and thickness of binding wire TK18. different types of cover blocks available TK19. basics of concreting works TK20. basics of formwork</p>
<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 should 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 CS2. prepare and provide clear and simple instructions, details and sketches to co-workers</p> <p><b>Reading Skills</b></p> <p>The individual on the job should be able to:</p> <p>CS3. read bar bending schedules provided by the supervisor for placing and fixing of steel reinforcement bars</p>

	<p>CS4. 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>CS5. read and interpret sketches, drawings or instructions provided for the required work</p> <p>CS6. 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>
	<p><b>Oral Communication (Listening and Speaking skills)</b></p>
	<p>The individual on the job should be able to:</p> <p>CS7. 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>CS8. listen attentively and interpret communication/instructions from the supervisor and other co-workers</p> <p>CS9. convey information clearly and concisely to co-workers</p>
<p><b>B. Professional Skills</b></p>	<p><b>Decision Making</b></p>
	<p>The individual on the job should be able to:</p> <p>PS1. decide on correct method for insertion/ fixing of steel reinforcement bars for any kind of complex structure or in congested areas</p> <p>PS2. decide whether the working space is safe for working and also that a particular task is not creating hazardous conditions for others</p> <p>PS3. decide on manpower, tools, materials and equipment for a particular task</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. prioritise daily works as per the construction project requirements</p>
	<p><b>Customer Centricity</b></p>
	<p>The individual on the job should be able to:</p> <p>PS6. complete work as per agreed time schedule and quality</p>
	<p><b>Problem Solving</b></p>
	<p>The individual on the job should be able to:</p> <p>PS7. resolve any conflicts within the team</p> <p>PS8. rectify any problem related to fixing or insertion of steel reinforcements in congested areas</p>
	<p><b>Analytical Thinking</b></p>
	<p>The individual on the job should be able to:</p> <p>PS9. insert and fix steel reinforcement bars in complex structures</p> <p>PS10. correlate the sequence of reinforcement works with respect to other proceeding activities of other teams at the site</p> <p>PS11. optimise resources relating to reinforcement works</p> <p>PS12. minimise material wastage</p>

	<p><b>Critical Thinking</b></p> <p>The individual on the job should be able to:</p> <ul style="list-style-type: none"><li>PS16. evaluate the complexity of the task and seek assistance and support whenever required</li><li>PS17. identify and deal with or report violation of any safety norms which may lead to accidents</li></ul>
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**UNIT 4** [This Unit covers the skills and knowledge required by a Steel Fixer to work effectively within a team to achieve the desired results].

<b>Unit No.</b>	<b>04</b>
<b>Unit Title</b>	<b>Work effectively in a team to deliver desired results at the workplace</b>
<b>Description</b>	This Unit describes the skills and knowledge required to work effectively within a team to achieve the desired results
<b>Scope</b>	This Unit covers the following: <ul style="list-style-type: none"> <li>• Interact and communicate effectively with co-workers, superiors and subordinates.</li> <li>• Support co-workers, superiors and subordinates within the team and across interfacing teams to ensure effective execution of assigned tasks</li> </ul>
<b>Performance Criteria (PC) with respect to the Scope</b>	
<b>Element</b>	<b>Performance Criteria (PC)</b>
<b>Interact and communicate effectively with co-workers, superiors and subordinates</b>	To be competent, the individual should 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
<b>Support co-workers to ensure effective execution of assigned tasks</b>	To be competent, the individual should 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. PC9. observe safety procedures
<b>Knowledge and Understanding (K)</b>	
<b>A. Organisational Context (Knowledge of the company, organisation, its processes)</b>	The individual on the job should 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 construction site, etc. OK4. different modes of communication and their appropriate usage OK5. importance of creating healthy and cooperative work environment within and among teams

<b>B. Technical Knowledge</b>	<p>The individual on the job should demonstrate knowledge and understanding of:</p> <ul style="list-style-type: none"> <li>TK1. different activities within his/her work area where interaction with other workers is required</li> <li>TK2. applicable techniques of work, materials used, tools used, safety standards.</li> <li>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 construction site</li> <li>TK4. importance and need to support co-workers facing problems for smooth workflow</li> </ul>
<b>Skills (S)</b>	
<b>A. Core Skills/ Generic Skills</b>	<b>Writing Skills</b>
	<p>The individual on the job should be able to:</p> <ul style="list-style-type: none"> <li>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</li> </ul>
	<b>Reading Skills</b>
	<p>The individual on the job should be able to:</p> <ul style="list-style-type: none"> <li>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</li> <li>CS3. read communications from team members regarding work completed, materials and tools used, as well as support required</li> <li>CS4. interpretation of legends from set of drawings</li> </ul>
<b>B. Professional Skills</b>	<b>Oral Communication (Listening and Speaking skills)</b>
	<p>The individual on the job should be able to:</p> <ul style="list-style-type: none"> <li>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</li> <li>CS6. listen attentively and follow instructions/communications shared by superiors and co-workers</li> <li>CS7. orally communicate with co-workers regarding support required to successfully complete work</li> </ul>
	<b>Decision Making</b>
	<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</li> <li>PS2. encourage risk-based thinking personal and environment for persons</li> <li>PS3. determine adequacy on manpower, tools, materials and equipment for a particular task</li> </ul>
	<b>Plan and Organise</b>
	<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 collaboration with team members and superiors</li> <li>PS5. prioritise daily works as per the construction project requirements</li> <li>PS6. complete work as per agreed time schedule and quality</li> <li>PS7. personal tools box</li> </ul>

	<b>Problem Solving</b>
	The individual on the job should be able to: PS8. resolve any conflicts within the team PS9. propose any problem related to fixing or insertion of steel reinforcements in congested areas PS10. resolve and rectify the problem upon approval by superiors
	<b>Analytical Thinking</b>
	The individual on the job should be able to: PS11. analyse and convey to the superior and carry out remedial action PS12. correlate the sequence of reinforcement works with respect to other proceeding activities of other teams at the site PS13. optimise resources relating to reinforcement works PS14. minimise any resource wastage PS15. evaluate the complexity of the task and seek assistance and support whenever required PS16. Analyse the performance of structural element in the process of next technological steps in work execution.
	<b>Critical Thinking</b>
	The individual on the job should be able to: PS17. identify and deal with or report violation of any safety norms which may lead to accidents PS18. Encourage incident reporting and regular risk assessment to support continual improvement in work processes.



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

<b>Unit No.</b>	<b>05</b>
<b>Unit Title</b>	<b>Plan and organise work to meet expected outcomes</b>
<b>Description</b>	This Unit describes the skills and knowledge required to plan and organise own work in order to meet expected outcome
<b>Scope</b>	This Unit covers the following: <ul style="list-style-type: none"> <li>• Prioritise work activities to achieve desired results</li> <li>• Organise resources prior to commencement of work</li> </ul>
<b>Performance Criteria (PC) with respect to the Scope</b>	
<b>Element</b>	<b>Performance Criteria (PC)</b>
<b>Prioritise work activities to achieve desired results</b>	To be competent, the individual should be able to: PC1. understand clearly the 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
<b>Organise resources prior to commencement of work</b>	To be competent, the individual should 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 used PC12. ensure that work processes adopted are in line with the specified standards and instructions
<b>Knowledge and Understanding (K)</b>	
<b>A. Organisation-al Context (Knowledge of the company, organisation, and its processes)</b>	The individual on the job should demonstrate knowledge and understanding of: OK1. importance of housekeeping OK2. policies, procedures and work targets set by superiors OK3. roles and responsibilities in executing own work for and that of subordinates
<b>B. Technical Knowledge</b>	The individual on the job should 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
<b>Skills (S)</b>	
<b>A. Core Skills/ Generic Skills</b>	<b>Writing Skills</b>
	The individual on the job should 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
	<b>Reading Skills</b>
	The individual on the job should 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
	<b>Oral Communication (Listening and Speaking skills)</b>
<b>B. Professional Skills</b>	The individual on the job should 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, timelines, etc.
	<b>Decision Making</b>
	The individual on the job should be able to: PS1. participate in deciding on what sequence is to be adopted for execution of work
	<b>Plan and Organise</b>
	The individual on the job should be able to: PS2. plan and organise the materials, tools and equipment required to execute the work PS3. complete all assigned tasks with proper planning and organisation
	<b>Problem Solving</b>
	The individual on the job should be able to: PS4. arrange for or seek help to arrange for materials, tools and equipment in case of a shortfall
	<b>Analytical Thinking</b>
	The individual on the job should 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
	<b>Critical Thinking</b>
The individual on the job should be able to: PS6. evaluate potential solutions to minimise avoidable delays and wastages at the construction site	

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

<b>Unit No.</b>	<b>06</b>
<b>Unit Title</b>	<b>Work according to occupational health, safety and environment rules and protocols at the construction site</b>
<b>Description</b>	This Unit describes the skills and knowledge required to work according to personal health, safety and environmental rules and protocols at the construction site
<b>Scope</b>	This Unit covers the following: <ul style="list-style-type: none"> <li>• Follow safety norms as defined by the organisation</li> <li>• Adopt healthy and safe work practices</li> <li>• Implement good housekeeping and environment protection process and activities</li> </ul>
<b>Performance Criteria (PC) with respect to the Scope</b>	
<b>Element</b>	<b>Performance Criteria (PC)</b>
<b>Follow safety norms as defined by the Organisation</b>	To be competent, the individual should 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 construction 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 and report near misses, unsafe conditions and acts PC6. basic knowledge of the register of the legal requirements
<b>Adopt healthy and safe work practices</b>	To be competent, the individual should be able to: PC7. adopt risk based thinking in line with the hierarch of controls PC8. correctly use appropriate Personal Protective Equipment (PPE) as follows: <ol style="list-style-type: none"> <li>a) head protection;</li> <li>b) ear protection;</li> <li>c) fall protection;</li> <li>d) foot protection;</li> <li>e) face and eye protection;</li> <li>f) hand and body protection; and</li> <li>g) respiratory protection (if required)</li> </ol> PC9. handle all work related tools, materials and equipment safely PC10. follow safe disposal of waste, harmful and hazardous materials as per the environmental, health and safety guidelines PC11. properly install and apply all safety equipment as instructed PC12. follow safety protocol and practices as laid down by the environmental, health and safety department/team at the construction site

<b>Implement housekeeping practices</b>	To be competent, the individual should be able to: PC13. collect and deposit construction waste into identified containers before disposal, clearly labelling and separating containers with toxic or hazardous wastes PC14. apply ergonomic principles wherever required
<b>Knowledge and Understanding (K)</b>	
<b>A. Organisational Context (Knowledge of the company/ organisation and its processes)</b>	The individual on the job should demonstrate knowledge and understanding of: OK1. reporting procedures in cases of incidents, breaches or hazards to site safety, accidents and emergency situations as per organisational guidelines OK2. types of safety hazards at construction sites OK3. basic work ergonomic principles
<b>B. Technical Knowledge</b>	The individual on the job should demonstrate knowledge and understanding of: TK1. the procedure for responding to accidents and other emergencies at the construction site TK2. tools for conducting risk assessment TK3. appropriate personal protective equipment to be used based on prevailing working conditions TK4. importance of handling tools, equipment and materials appropriately to avoid damage TK5. health and environmental effects of various types of construction materials TK6. environmental protection methods TK7. storage of waste in appropriate locations, such as: a. non-combustible scrap materials and debris; b. combustible scrap materials and debris; c. general construction waste and trash (non-toxic and non-hazardous); d. any other hazardous wastes; and e. any other flammable wastes. TK8. use hazardous materials in a safe and appropriate manner TK9. safe usage of tools and equipment TK10. housekeeping activities relevant to a particular task
<b>Skills (S)</b>	
<b>A. Core Skills/ Generic Skills</b>	<b>Writing Skills</b>
	The individual on the job should 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
	<b>Reading Skills</b>
The individual on the job should 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	

	<p><b>Oral Communication (Listening and Speaking skills)</b></p> <p>The individual on the job should be able to:</p> <p>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> <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 site conditions, hazards, accidents, etc.</p>
<p><b>B. Professional Skills</b></p>	<p><b>Decision Making</b></p> <p>The individual on the job should be able to:</p> <p>PS1. avoid creating unsafe working conditions for others</p> <p>PS2. keep the workplace clean and tidy</p>
	<p><b>Plan and Organise</b></p> <p>The individual on the job should be able to:</p> <p>PS3. plan and organise the safety materials, tools and equipment required to execute the work</p>
	<p><b>Customer Centricity</b></p> <p>The individual on the job should be able to:</p> <p>PS4. complete all assigned tasks safely, taking into account the safety of the end users</p>
	<p><b>Problem Solving</b></p> <p>The individual on the job should be able to:</p> <p>PS5. identify 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><b>Analytical Thinking</b></p> <p>The individual on the job should be able to:</p> <p>PS6. assess and analyse areas which may affect health, safety and environment protocol set at the construction site</p>
	<p><b>Critical Thinking</b></p> <p>The individual on the job should 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

Equipment, tools and consumable materials used by the job holder include, but are not limited to:

**Hand Tools:** Chisel, Hammer, Bar tying hook, Bending lever, Gauge measure, Spanners, Hack saw blade and frame, Steel cutting blade, Bar tying hook, Bending lever, etc.

**Measuring Instruments:** Steel scale, Try Scale, Spirit level, Plumb bob, Measuring tape, etc.

**Power Tools:** Cutting machine, Bending machine, Threading machine, etc.

**Consumables and General requirements:** Reinforcement steel bar, Welding electrodes, Binding wires, Cover blocks, Wooden planks, Steel reinforcement bars tying machine, Lifting appliance (Sling, Shackle, Belts), Mechanical coupler, First aid kit, Fire extinguishers, etc.

**Personal Protective Equipment:** Safety helmet, Safety goggles, Safety shoes, Safety belt, Cotton gloves, Ear plugs, Reflective jackets, Dust mask, Fire prevention kit, etc.

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

Dilemmas associated with the job of Steel Fixer include: exposure 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, 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 construction safety issues, planning and prioritising work, etc.

## 7. WORKING CONDITIONS/ENVIRONMENT

Working conditions include indoor and outdoor construction sites as well as workshops and factories, 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 relatively heavy objects. In most cases, the

job involves working normal hours, but in some instances, shift work and regular overtime may be required. The job also requires wearing suitable protective clothing such as works suits, ear protectors, safety visors or goggles, gloves and hardhats, safety harnesses etc.

## **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, occupational health and 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, suppliers of equipment/ tools/ consumables, fellow Steel Fixers from other companies, labour unions/ occupational health and safety associations, etc.

## **9. PHYSICAL DEMANDS ON THE BODY**

- Ability 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);
- Strenuous works that may cause musculoskeletal disorders;
- 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>	NOS.SF.01		
<b>ZQF Level</b>	3	<b>Version Number</b>	01
<b>Sector</b>	Construction	<b>Date of Approval</b>	February, 2021
<b>Sub Sector</b>	Real Estate and Infrastructure Construction	<b>Date of Last Review</b>	N/A
<b>Occupation</b>	Bar Bending and Fixing	<b>Date of Next Review</b>	March, 2026

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