

**REPUBLIC OF KENYA**

**OCCUPATIONAL STANDARD**

**FOR**

**STEEL FIXER LEVEL 3**

**LEVEL 3**

**PROGRAMME CODE: 0732 254A**

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**FOREWORD**

The provision of quality education and training is fundamental to the Government’s overall strategy for social economic development. Quality education and training will contribute to achievement Kenya’s development blue print and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution and this resulted to the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 4 of 2016). A key feature of this policy is the radical change in the design and delivery of the TVET training. The policy document requires that training in TVET shall be competency based, curriculum development shall be industry led, certification shall be based on demonstration of competence and mode of delivery shall allow for multiple entry and exit in TVET programs.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that this Occupational Standard has been developed for the purpose of informing development of a competency-based Steel Fixing Level 3 Curriculum. This Occupational Standard will also form the basis for assessment of an individual for competency certification.

It is my conviction that this Occupational Standard will play a great role towards development of a competent human resource for the Construction Sector’s growth and sustainable development.

**PREFACE**

Kenya Vision 2030 aims to transform the country into a newly industrializing, “middle income country providing a high-quality life to all its citizens by the year 2030”. Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through life-long education and training. TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency-Based Education and Training (CBET).

The Technical and Vocational Education and Training Act No. 29 of 2013 and the Sessional Paper No. 4 of 2016 on Reforming Education and Training in Kenya, emphasized the need toreform curriculum development, assessment and certification. This called for a shift to CBET to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

The industry in conjunction with national polytechnics and other national agencies have developed this Steel Fixing Level 3 Occupational Standard. The Standard is designed and organized with clear performance criteria for each element of a unit of competency. It also outlines the required knowledge and skills for the performance of prescribed tasks as well as evidence guide for assessment purposes.

# ACKNOWLEDGEMENT

This curriculum has been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing the curriculum, significant involvement and support was received from industry and various organizations.

I appreciate National Construction Sector Skills Committee who enabled the development of this Occupation standard. I recognize with appreciation the role of the SSC in ensuring that competencies required by the industry are addressed in this Occupation standard.

I also thank all stakeholders in the Construction sector for their valuable input and all those who participated in the process of developing this curriculum.

I am convinced that this Occupation standard will go a long way in ensuring that workers in construction sector will acquire competencies that will enable them perform their work more efficiently.

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# ABBREVIATIONS AND ACRONYMS

PPE Personal Protective Equipment

TVET Technical and Vocational Education and Training

ISCED International Standard Classification of Education

OSHP Occupational Safety Health Practices

# KEY TO UNIT CODE

**Sector / Industry**

**Sub Sector**

**Occupational Area**

**Version Control**

**Unit of Competence Number**

**ISCED level, Programme Orientation and Level of Completion**

xx

x

xxx

x

x

x

# OVERVIEW

Steel fixing Level 3 qualification consists of competencies that an individual must possess to carry out steel fixing for structural elements. It entails constructing formwork, preparing reinforcement materials and performing steel fixing for different structural elements.

**Units of Competency**

|  |  |
| --- | --- |
| **Code** | **Unit of Competency Title** |
| 0732 251 01A | CONSTRUCT FORMWORK |
| 0732 251 02A | PREPARE REINFORCEMENT MATERIALS |
| 0732 251 03A | PERFORM STEEL FIXING |

# CONSTRUCT FORMWORK

**UNIT CODE**: **0732 251 01A**

**Unit Description**

This unit specifies the competencies required to construct formwork. It entails Constructing column formwork, beam formwork, stairs formwork, slab formwork and retaining wall and bridge formwork.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **Element**  *These describe the key outcomes which make up workplace function* | **Performance Criteria**  *These are assessable statements, which specify the required level of performance for each of the elements.*  ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Construct column formwork | * 1. Column formwork materials are assembled as per technical specification   2. Kickers to support column formwork are provided as per technical specification   3. Column formwork is erected as per the column specification.   4. Shoring of column formwork is used as per technical specification   5. Checks for formwork alignment and verticality is carried out as per technical specification |
| 1. Construct beam formwork | * 1. Beam formwork materials are assembled as per technical specification   2. Beam formwork is erected as per technical specification   3. Shoring of beam formwork is used as per technical specification   4. Checks for formwork alignment and straightness is carried out. |
| 1. Construct stairs formwork | * 1. Stair formwork materials are assembled as per technical specification   2. Stair formwork is erected as per the specification.   3. Shoring of stair formwork is used.   4. Checks for formwork alignment and straightness is carried out. |
| 1. Construct slab formwork | * 1. Stair formwork materials are assembled as per technical specification   2. Slab formwork is erected as per the specification.   3. Shoring of slab formwork is used.   4. Checks for formwork alignment and straightness is carried out. |
| 1. Construct retaining wall and bridge formwork | * 1. Materials for retaining walls and bridges formwork   2. Retaining wall and bridge formwork is erected as per the specification.   3. Shoring for retaining wall and bridge formwork is used.   4. Checks for formwork alignment and straightness is carried out |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variables** | **Range** |
| * + - 1. Structural elements may include but not limited to: | * Beams * Columns * Slab * Foundation * Stairs * Bridges * Retaining |
| * + - 1. Formwork material may include but not limited to: | * Timber * Steel formwork * Trappers * Assorted nails |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Critical thinking
* Interpretation
* Drawing equipment handling
* Analysis and synthesis
* Communication
* Interpersonal

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Measurement
* Drawing techniques
* Structural elements
* Materials knowledge

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate***   1. Slab formwork is erected as per the specification. 2. Column formwork is erected as per the specification. 3. Beam formwork is erected as per the specification 4. Stair formwork is erected as per the specification 5. Bridge formwork is erected as per the specification 6. Retaining wall formwork is erected as per the specification 7. Checks for formwork alignment and straightness are carried out |
| 1. Resource   Implications | The following resourcesshould be provided:   1. Access to relevant workplace where assessments can take place. 2. Appropriately simulated environment where assessments can take place 3. Resources relevant to the proposed activity or tasks |
| 1. Methods of   Assessment | Competency may be assessed through:   1. Practical 2. Projects 3. Portfolio of evidence 4. Third party report 5. Written tests 6. Oral tests |
| 1. Context of Assessment | Assessment may be done in a workplace or in a simulated workplace. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# PREPARE REINFORCEMENT MATERIALS

**UNIT CODE: 0732 251 02A**

**Unit Description**

This unit specifies the competencies required to prepare steel reinforcements for steel fixing. It entails measuring and cutting steel rebars, bending and shaping rebars and joining steel reinforcements

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **Element**  *These describe the key outcomes which make up*  *workplace function* | **Performance Criteria**  *These are assessable statements, which specify the required level of performance for each of the elements.* ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Measure and cut steel rebars | 1. Personal Protective Equipment is donned as per Occupational Safety Health Practices (OSHP) 2. Numeracy computations on unit conversion and lengths are carried out as per job requirement 3. Interpreted simple structural drawings 4. Sketched simple structural drawings 5. Tools and equipment for measuring and cutting steel rebars are identified as per job requirement 6. Steel rebars are measured as per the specification. 7. Measured steel rebars are cut as per job requirement |
| 1. Bend and shape rebars | * 1. Tools and equipment for bending and shaping steel rebars are identified based on job requirement   2. Tools and equipment are set up as per job requirement   3. Steel rebars are bent based on job requirement   4. Steel rebars are shaped as per the provided bar bending schedule. |
| 1. Join steel reinforcement | * 1. ***Steel rebar jointing method*** is selected as per design specification   2. Jointing tools and equipment are selected as per job requirement   3. Steel reinforcement elements are jointed as per design specification |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variables** | **Range** |
| Personal Protective Equipment may include but not limited to: | * 1. Hard hat / helmet   2. Dust Mask   3. Goggles   4. Ear plugs / ear muffs   5. Dust coat / coverall   6. Gloves   7. Safety shoes /gumboots   8. Reflector jackets |
| Hazards and risks may include but not limited to: | * 1. Slips, trips, falls, manual handling injuries, exposure to UV light, and formwork failure   2. Proper safety measures, including adequate edge protection, fall prevention, and personal protective equipment (PPE) |
| Measuring and cutting materials may include but not limited to: | * 1. Tape measure/steel tape   2. Caliper   3. Hacksaw   4. Rebar cutter |
| Bar bending and shaping materials may include but not limited to: | * 1. Hand rebar bender   2. Bend vise   3. Anvil with bend fork |
| Rebar fixing and tying tools may include but not limited to: | * 1. Plies   2. Hacksaw   3. Binding wire   4. Couplers |
| Simple plane figures may include but not limited to: | * 1. Squares   2. Rectangles   3. Circles |
| 7. Simple structural drawings may include but not limited to: | * 1. Simple columns section drawings   2. Simple beam section drawings |
| 8. Steel rebars jointing methods may include but not limited to: | * 1. binding   2. bolted connection   3. welding   4. riveting |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

1. Communication skills
2. Measuring skills
3. Numeracy skills
4. Interpersonal skills
5. Proper tool and equipment use
6. Steel reinforcement fixing and tying skills
7. Reinforcement placement skills
8. Rebar bending and shaping skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

1. OSHP
2. Measurement
3. Rebar sizes
4. Rebar spacing and cover to reinforcement
5. Proper use and maintenance of tools and equipment

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate***:   1. Used steel fixing tools and equipment as per work requirement. 2. Conducted measurement and cutting of steel to required lengths. 3. Carried out bar bending and shaping as per work requirement. |
| 1. Resource   Implications | The following resourcesshould be provided:   * 1. Access to relevant workplace where assessments can take place.   2. Appropriately simulated environment where assessments can take place   3. Resources relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical   2. Projects   3. Portfolio of evidence   4. Third party report   5. Written tests   6. Oral tests |
| 1. Context of Assessment | Assessment may be done in a workplace or in a simulated workplace. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

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# PERFORM STEEL FIXING

**UNIT CODE: 0732 251 03A**

**Unit Description**

This unit specifies the competencies required to perform steel fixing. It entails fixing and tying column reinforcement, beam reinforcement, staircase reinforcement, slab reinforcement and retaining wall and bridges reinforcement.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **Element**  *These describe the key outcomes which make up*  *workplace function* | **Performance Criteria**  *These are assessable statements, which specify the required level of performance for each of the elements.* ***Bold and italicized terms*** ***are elaborated in the Range*** |
| 1. Fix and tie column reinforcement | * 1. Column reinforcement is prepared as per technical specifications   2. Column reinforcement is bent as per technical specifications   3. Column reinforcement is tied as per technical specifications   4. Column reinforcement is placed in formwork as per technical specifications |
| 1. Fix and tie beam reinforcement. | * 1. Beam reinforcement is prepared as per technical specifications   2. Beam reinforcement is bent as per technical specifications   3. Beam reinforcement is tied as per technical specifications   4. Beam reinforcement is placed in formwork as per technical specifications |
| 1. Fix and tie staircase reinforcement | * 1. Stair reinforcement is prepared as per technical specifications   2. Stair reinforcement is bent as per technical specifications   3. Stair reinforcement is tied as per technical specifications   4. Stair reinforcement is placed in formwork as per technical specifications |
| 1. Fix and tie slab reinforcement | * 1. Slab reinforcement is prepared as per technical specifications   2. Slab reinforcement is bent as per technical specifications   3. Slab reinforcement is tied as per technical specifications   4. Slab reinforcement is placed in formwork as per technical specifications |
| 1. Fix and tie retaining wall and bridges reinforcement | * 1. Retaining wall and bridges reinforcement is prepared as per technical specifications   2. Retaining wall and bridges reinforcement is tied as per technical specification   3. Slab reinforcement is placed in formwork s per technical specifications. |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variables** | **Range** |
| Structural elements include but not limited to: | * 1. Beams   2. Columns   3. Stairs   4. Slabs   5. Bridges   6. Retaining walls |
| Measuring and cutting materials may include but not limited to: | * 1. Tape measure/steel tape   2. Caliper   3. Hacksaw/ rebar cutter |
| Bar bending and shaping materials may include but not limited to: | * 1. Hand rebar bender   2. Bend vise   3. Anvil with bend fork |
| Rebar fixing and tying tools may include but not limited to: | * 1. Plies   2. Hacksaw   3. Binding wire   4. Couplers |
| 1. Rebar spacing and alignment tools may include but not limited to: | * 1. Spacer blocks   2. Rebar chairs & supports |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

1. Fixing and tying reinforcements skills
2. Reinforcement placement skills
3. Rebar bending and shaping skills
4. Communication skills
5. Measuring skills
6. Numeracy skills
7. Interpersonal skills
8. Proper tool and equipment use

**Required Knowledge**

The individual needs to demonstrate knowledge of:

1. OSHP
2. Measurement
3. Rebar sizes
4. Structural elements and their functions
5. Rebar spacing and cover to reinforcement
6. Proper use and maintenance of tools and equipment

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate***:   1. Fixed and tied column reinforcement as per work requirement 2. Fixed and tied beam reinforcement as per work requirement 3. Fixed and tied stairs reinforcement as per work requirement 4. Fixed and tied slab reinforcement as per work requirement 5. Fix and tie retaining wall and bridges reinforcement as per work requirement |
| 1. Resource Implications | The following resourcesshould be provided:   * 1. Access to relevant workplace where assessments can take place.   2. Appropriately simulated environment where assessments can take place   3. Resources relevant to the proposed activity or tasks |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Practical   2. Projects   3. Portfolio of evidence   4. Third party report   5. Written tests   6. Oral tests |
| 1. Context of Assessment | Assessment may be done in a workplace or in a simulated workplace. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |