****

**REPUBLIC OF KENYA**

**COMPETENCY BASED MODULAR CURRICULUM**

**FOR**

**STEEL FIXING**

**KNQF LEVEL 3**

**PROGRAMME ISCED 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 and economic development. Quality education and training contribute to the achievement of Kenya’s development blueprint and sustainable development goals.

Reforms in the education sector are necessary to achieve Kenya Vision 2030 and meet the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution, and this resulted in the formulation of the Policy Framework for Reforming Education and Training in Kenya (Sessional Paper No. 14 of 2012). A key feature of this policy is the radical change in the design and delivery of TVET training. This policy document requires that training in TVET be competency-based, curriculum development be industry-led, certification be based on demonstration of competence, and the mode of delivery allow for multiple entry and exit in TVET programmes.

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 curriculum has been developed. For trainees to build their skills on foundational hands-on activities of the occupation, units of learning are grouped in modules. This has eliminated duplication of content and streamlined exemptions based on skills acquired as a trainee progresses in the up-skilling process, while at the same time allowing trainees to be employable in the shortest time possible through the acquisition of part qualifications.

It is my conviction that this curriculum will play a great role in developing competent human resources for the Construction Sector’s growth and development.

**PRINCIPAL SECRETARY**

**STATE DEPARTMENT FOR TVET**

**MINISTRY OF EDUCATION**

**PREFACE**

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

TVET Act, CAP 210A and Sessional Paper No. 1 of 2019 on Reforming Education and Training in Kenya for Sustainable Development emphasized the need to reform 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 the Kenyan labour force.

This curriculum has been developed in adherence to the Kenya National Qualifications Framework and CBETA standards and guidelines. The curriculum is designed and organized into Units of Learning with Learning Outcomes, suggested delivery methods, learning resources, and methods of assessing the trainee’s achievement. In addition, the units of learning have been grouped in modules to concretize the skills acquisition process and streamline upskilling.

I am grateful to all expert trainers and everyone who played a role in translating the Occupational Standards into this competency-based modular curriculum.

# ACKNOWLEDGMENT

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 were received from expert trainers, institutions and organizations.

I recognize with appreciation the role of the National Sector Skills Committee (NSSC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the Construction sector for their valuable input and everyone who participated in developing this curriculum.

I am convinced that this curriculum will go a long way in ensuring that individuals aspiring to work in the Construction Sector acquire competencies to perform their work more efficiently and effectively.

# 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

xx

x

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# COURSE 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.

**SUMMARY OF UNITS OF LEARNING**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Units Title** | **Unit Duration (Hours)** | **Credit Factor** |
| 0732 251 01 | FORMWORK CONSTRUCTION | 100 | 10.0 |
| 0732 251 02 | REINFORCEMENT MATERIALS PREPARATION | 80 | 8.0 |
| 0732 251 03 | STEEL FIXING | 120 | 12.0 |
| **Sub Total** | | **300** | **30.0** |
| **Industrial Attachment** | | **240** | **24.0** |
| **GRAND TOTAL** | | **540** | **54.0** |

The total duration of the course is 540 hours.

**Entry Requirements**

An individual entering this course should have any of the following minimum requirements:

1. Kenya Certificate of Primary Education (KCPE)
2. Kenya Certificate of Secondary Education (KCSE) mean grade E.
3. Any other qualification as determined by the Technical and Vocational Education and Training Authority (TVETA)

**Field attachment**

An individual enrolled in this course will be required to undergo a field attachment for a minimum period of 240 hours in a building construction sector.

**Trainer qualification**

A trainer for any of the Units of Competency in this course must:

1. Have a minimum of Craft Certificate in Building Technology or its equivalent.
2. Be registered by TVETA.

**Assessment**

The course shall be assessed formatively and summatively:

1. During formative assessment all performance criteria shall be assessed based on performance criteria weighting.
2. During summative assessment basic and common units shall be integrated in the core units.
3. Summative assessment shall involve practical assessment focusing more on critical aspects of the respective unit of competency.
4. Theoretical and practical weight shall be 10:90 respectively for each unit of learning;
5. Theoretical (written/oral) assessment shall have formative and summative assessments weighted at 60% and 40% respectively in the overall unit of learning score
6. Assessment performance rating for each unit of competency shall be as follows:

|  |  |
| --- | --- |
| **MARKS** | **COMPETENCE RATING** |
| 80 -100 | Attained Mastery |
| 65 - 79 | Proficient |
| 50 - 64 | Competent |
| 49 and below | Not Yet Competent |
| Y | Assessment Malpractice/irregularities |

1. Assessment for Recognition of Prior Learning (RPL) may lead to award of part and/or full qualification.

**Certification**

To be awarded certificate in Steel fixing Level 3, an individual must demonstrate competence in all the units of competency in the qualification pack.

The certificate in Steel fixing Level 3 will be awarded by QAI

# FORMWORK CONSTRUCTION

**UNIT CODE: 0732 251 01A**

**UNIT DURATION:** 100 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Construct Formwork

**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.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
|  | Construct column formwork | 20 |
|  | Construct beam formwork | 10 |
|  | Construct stairs formwork | 20 |
|  | Construct slab formwork | 20 |
|  | Construct retaining wall and bridge formwork | 30 |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Construct column formwork | 1. Definition of terms    * 1. Formwork      2. Column      3. Materials 2. Tools and equipment    * 1. Safety; Wear Personal protective equipment (PPE) 3. Preparation of formwork materials 4. Cutting, measuring, joining    * 1. Measurements      2. Construction procedure 5. Column Formwork Materials    * 1. Timber      2. Steel      3. Nails      4. Assembling of material 6. Erection of column formwork    * 1. Kickers      2. Supports      3. Column specification 7. Shoring    * 1. Types of shoring      2. Use of Shoring 8. Column formwork Alignment    * 1. Vertical alignment      2. Horizontal alignment      3. Checks for column formwork alignment | * Practical * Projects * Written tests * Portfolio of evidence * Third party reports |
| 1. Construct beam formwork | * 1. Definition of terms      1. Formwork      2. Beam formwork      3. Materials   2. Tools and equipment      1. Safety; Wear Personal protective equipment (PPE)      2. Measurements      3. Construction procedure   3. Preparation of formwork materials   Cutting, measuring, joining   * + 1. Measurements     2. Construction procedure   1. Beam Formwork Materials      1. Timber      2. Steel Nails      3. Assembling of material   2. Beam Formwork Materials      1. Timber      2. Steel Nails      3. Assembling of material   3. Erection of beam formwork      1. Supports      2. Beam specification   4. Shoring      1. Types of shoring      2. Use of Shoring   5. Beam formwork Alignment      1. Vertical alignment      2. Horizontal alignment | * Practical * Projects * Written tests * Portfolio of evidence * Third party reports |
| 1. Construct stairs formwork | * 1. Definition of terms      1. Formwork      2. Beams      3. Materials   2. Tools and equipment      1. Safety; Wear Personal protective equipment (PPE)      2. Measurements      3. Construction procedure   3. Formwork Materials      1. Timber      2. Steel Nails      3. Assembling of material   4. Preparation of formwork materials      1. Measurements      2. Construction procedure; Cutting, measuring, joining   5. Erection of stairs formwork      1. Kickers      2. Supports      3. stairs specification   6. Shoring      1. Types of shoring      2. Use of Shoring   7. Stairs formwork Alignment      1. Vertical alignment      2. Horizontal alignment | * Practical * Projects * Written tests * Portfolio of evidence * Third party reports |
| 1. Construct slab formwork | * 1. Definition of terms      1. Formwork      2. Slab Materials      3. Tools and equipment   2. Safety      1. Wear Personal protective equipment (PPE)   3. Preparation of formwork materials      1. Measurements      2. Construction procedure; Cutting, measuring, joining   4. Slab Formwork Materials      1. Timber      2. Steel Nails      3. Trappers   5. Assembling of material   6. Erection of slab formwork      1. Kickers      2. Supports      3. slab specification   7. Shoring      1. Types of shoring      2. Use of Shoring   8. Slab formwork Alignment      1. Vertical alignment      2. Horizontal alignment | * Practical * Projects * Written tests * Portfolio of evidence * Third party reports |
| 1. Construct retaining wall and bridge formwork | * 1. Definition of terms      1. Formwork      2. Bridges      3. Materials   2. Tools and equipment   3. Safety; Wear carpentry Personal protective equipment (PPE)   4. Preparation of formwork materials      1. Measurements      2. Construction procedure; Cutting, measuring, joining   5. Retaining walls and bridge Formwork Materials      1. Timber      2. Steel Nails   6. Assembling of material   Erection of column formwork   * + 1. Kickers     2. Supports     3. Column specification   1. Shoring      1. Types of shoring      2. Use of Shoring   2. Retaining walls and bridge formwork Alignment      1. Vertical alignment      2. Horizontal alignment | * Practical * Projects * Written tests * Portfolio of evidence * Third party reports |

**Suggested Methods of Instruction**

1. Practical
2. Demonstration
3. Project based learning
4. Group discussion
5. Hands on practice

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Textbooks | * Modern cabinet making * Hand crafted cabinetry | 5  5 | 1:5 |
|  | Manuals | Manual on cabinetry works | 5 | 1:5 |
|  | Charts | * Flip Charts * Rules and Regulations | 5  5 | 1:5 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 1 (30\* 40 sq. feet) | 1 | 1:25 |
|  | Workshop | 1 (35\* 50 sq. feet) | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Timber | Plank (4\*2) 7ft long  Battens (2\*1-long 7ft) | 3pcs  10pcs | 1:25 |
|  | Metal sheet | (4\*8)ft | 2pcs | 1:12 |
|  | Manufactured boards | * Plywood * Fibreboard * Block board * Soft board | 5pcs each | 1:5 |
|  | Oil |  | 5litres | 1:5 |
|  | Nails | Ordinary nails 1.5 inches  Assorted nails 2 inches  Assorted nails 2 inches  Panel pins | 5kg  5kgs  5kgs  5 kgs | 1:25 |
| **D** | **Tools and Equipment** | | | |
|  | Saw | Assorted | 25 pcs | 1:1 |
|  | Squares | Assorted | 25 pcs | 1:1 |
|  | Tape measure | Pieces | 25 pcs | 1:1 |
|  | Spirit levels | Pieces | 5 pcs | 1:5 |
|  | Bevel squares | Pieces | 13 pcs | 1:2 |
|  | Claw hammers | Pieces | 25 pcs | 1:1 |
|  | Plumb bobs | Pieces | 10 | 1:2 |

# REINFORCEMENT MATERIALS PREPARATION

**UNIT CODE: 0732 251 02A**

**UNIT DURATION:** 100 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Prepare Reinforcement Materials

**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

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S/No | **Learning Outcomes** | **Duration (Hours)** |
|  | Measure and cut steel rebars | **30** |
|  | Bend and shape rebars | **20** |
|  | Join steel reinforcement | **50** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning outcomes** | **Content** | **Suggested Assessment Methods** |
| 1. Measure and cut steel rebars | * 1. **Occupational Safety**       1. Safety in steel rebar cutting      2. Selection and use of PPE   2. **Measurement of rebar lengths**      1. Linear measuring tools         1. Steel tape         2. Builders square   3. Unit conversions      1. Millimeters      2. Centimeters      3. Inches      4. Feet   4. **Interpretation and Sketching of Simple Structural Drawings**      1. Symbols and conventions in reinforcement detailing      2. Interpreting and sketching reinforcement placement and cutting details   5. **Tools and Equipment for Measuring and Cutting Steel Rebars**      1. Identification and selection of tools      2. Proper handling and maintenance of tools      3. Safe usage and storage of cutting tools   6. **Measuring Steel Rebars**       1. Procedures for measuring steel rebars as per specifications      2. Techniques for marking cutting points accurately      3. Avoiding measurement errors and wastage      4. **Cutting Steel Rebars**   7. Methods of cutting steel rebars (manual and machine cutting)      1. Step-by-step cutting procedures      2. Quality checks after cutting      3. Safe disposal of offcuts and waste materials      4. Current trends and emerging issues | 1. Practical assessment on measuring, cutting, bending, and shaping rebars  * Observation of practical exercises * Quizzes * Oral assessments |
| 1. Bend and shape rebars | * 1. **Tools and Equipment for Bending and Shaping**      1. Identification of manual and mechanical bending tools      2. Safe handling, maintenance, and storage of tools and equipment      3. Setting up tools and equipment based on job requirements   2. **Bending Steel Rebars**      1. Procedures for bending rebars as per job specifications      2. Techniques for different types of bends (e.g., 90-degree bends, hooks, stirrups, and cranks)      3. Use of bar bending machines vs. manual bending      4. Safety precautions when bending steel rebars   3. **Shaping Steel Rebars**       1. Marking and measuring rebars for shaping      2. Techniques for achieving accurate rebar shapes      3. Quality checks and corrections      4. Current trends and emerging issues | * Practical assessment on bending and shaping rebars * Observation of practical exercises * Quizzes * Oral assessments |
| 1. Join steel reinforcement | * 1. **Methods of jointing steel rebars**      1. Lapping      2. Welding      3. Mechanical couplers      4. Threaded connections   2. Tools and equipment used for jointing rebars  1. Rebar couplers 2. Tying wire 3. Tie wire twisters 4. Specialized cutting 5. Bending machines.    1. **Jointing steel rebars as per specification** | * Practical assessment on bending and shaping rebars * Observation of practical exercises * Quizzes * Oral assessments |

**Suggested Methods of Instruction**

* Demonstrations on tool handling, cutting and rebar bending
* Hands-on practical exercises in bending and shaping rebars
* Group work

**Recommended Resources for 20 Trainees**

* PPE (helmets, gloves, goggles, boots)
* Measuring tools (tape measures, steel rulers, calipers)
* Bending tools (manual benders, bar bending machines, jigs)
* Sample structural drawings and bar bending schedules
* Workbenches and steel rebars for practice

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Textbooks | * Reinforced Concrete Design Books | 5  5 | 1:5 |
|  | Manuals | * Manufacturer manuals for rebar cutting and bending tools | 5 | 1:5 |
|  | Charts | * Flip Charts * Rules and Regulations | 5  5 | 1:5 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | 1 (30\* 40 sq. feet) | 1 | 1:25 |
|  | Workshop | 1 (35\* 50 sq. feet) | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Rebars | Each 6 metres  D8  D10  D12  D16 | 10pcs each | 1:25 |
| **D** | **Tools and Equipment** | | | |
|  | Hack Saw | Assorted | 25 pcs | 1:1 |
|  | Squares | Assorted | 25 pcs | 1:1 |
|  | Tape measure | Pieces | 25 pcs | 1:1 |
|  | Rebar cutters | Pieces | 25 pcs | 1:1 |
|  | Angle grinders | Pieces | 25 pcs | 1:1 |
|  | Manual bending bench | Pieces | 25 pcs | 1:1 |
|  | Workbenches | Pieces | 13 pcs | 1:2 |

# STEEL FIXING

**UNIT CODE: 0732 251 03A**

**UNIT HOURS:** 120 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency:Perform steel fixing

**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, retaining wall, and bridges reinforcement.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| S/No | **Learning Outcomes** | **Duration (Hours)** |
|  | Fix and tie column reinforcement | **20** |
|  | Fix and tie beam reinforcement. | **10** |
|  | Fix and tie staircase reinforcement | **20** |
|  | Fix and tie slab reinforcement | **30** |
|  | Fix and tie retaining wall and bridges reinforcement | **40** |

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Fix and tie column reinforcement | * 1. Terms and concepts      1. Column      2. Sections   2. Personal protective equipment (PPE)   3. Column Fixing tools and equipment      1. tape measure      2. hack saw      3. pincer      4. plumb bob   4. Column Fixing materials      1. steel bars      2. binding wire      3. marking chalk   5. Column setting      1. Column positioning      2. Column sizes      3. Column setting procedures   6. Column jointing      1. Welding      2. Riveting      3. Bolting      4. Binding | * Practical * Projects * Assignments * Direct instruction * Visiting construction site. * Written assessment |
| 1. Fix and tie beam reinforcement | * 1. Terms and concepts      1. Beams      2. Beam Sections      3. Beam types   2. Personal protective equipment (PPE)   3. Beam Fixing tools and equipment      1. tape measure      2. hack saw      3. pincer   4. Beam Fixing materials      1. steel bars      2. binding wire      3. marking chalk      4. Beam setting   5. Beam positioning      1. Beam sizes      2. Beam setting procedures   6. Beam jointing      1. Welding      2. Riveting      3. Bolting      4. Binding | * Projects * Direct instruction * Visiting construction site. * Written assessment |
| 1. Fix and tie staircase reinforcement | * 1. Personal protective equipment (PPEs)   2. Staircase fixing materials, tools and equipment      1. tape measure      2. hack saw      3. pincer      4. binding wire   3. Setting of the staircase      1. Staircase members      2. Flight      3. Landing   4. Stair jointing      1. Riveting      2. Bolting      3. Binding | * Projects * Direct instruction * Visiting construction site. * Written assessment |
| 1. Fix and tie slab reinforcement | * 1. Terms and concept.      1. Slab      2. Types of slabs      3. Slab sections   2. Personal protective equipment (PPEs)   3. Slab fixing tools and equipment      1. tape measure      2. hack saw      3. pincer   4. Slab Fixing materials      1. steel bars      2. binding wire      3. marking chalk   5. Slab jointing      1. Welding      2. Riveting      3. Bolting      4. Binding | * Projects * Direct instruction * Visiting construction site. * Written assessment |
| 1. Fix and tie retaining wall and bridges reinforcement as per technical specification | * 1. Terms and concept.      1. Retaining wall      2. Retaining wall types      3. Retaining wall parts      4. Retaining wall sections   2. Personal protective equipment (PPEs)   3. Retaining wall steel fixing tools and equipment      1. tape measure      2. hack saw      3. pincer   4. Retaining wall steel fixing steel bars      1. binding wire      2. marking chalk   5. Retaining wall steel jointing      1. Riveting      2. Welding      3. Bolting      4. Binding | * Projects * Direct instruction * Visiting construction site. * Written assessment |

**Suggested Methods of Instruction**

* Practical
* Projects
* Demonstrations
* Group discussions
* Direct instructions

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Textbooks | 1. Simply stairs 2. Second edition stairs | 5  5 | 1:5 |
|  | Charts | * 1. Flip Charts   2. Rules and Regulations | 5  5 | 1:5 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Lecture/theory room | (9\* 8 sq. meters) | 1 | 1:25 |
|  | Workshop | (15\* 10 sq. meters) | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Assorted steel bars | 10m per trainee (diameters 8,10,16,20,25,32) | 25pcs | 1:1 |
|  | Binding wire | 1 roll | 25kgs | 1:25 |
|  | Reverting bolts | 25 packets | 1 packet /10 pieces | 1:1 |
|  | Marking chalk | packets | 3packets | 1:2 |
| **D** | **Tools and Equipment** | | | |
|  | pincer | pcs | 25 | 1:1 |
|  | Tape measures | Pieces | 25 pcs | 1:1 |
|  | Plumb bobs | Pieces | 10 | 1:2 |