

**REPUBLIC OF KENYA**

**OCCUPATIONAL STANDARDS**

**FOR**

**WELDER**

**KNQF LEVEL 3**

**PROGRAMME CODE: 0715 254A**

# 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 of Kenya’s development blueprint, Vision 2030 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 of Kenya 2010 and this resulted in 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.

This policy document requires that training in TVET institutions be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery to allow for multiple entry and exit in TVET programmes. These reforms demand that industry takes a leading role in occupational standards development to ensure it addresses competence needs.

It is against this background that these Occupational Standards have been developed for a competency-based welding and fabrication standard. These Occupational Standards will also be the basis for assessment of an individual for competence certification.

It is my conviction that these Occupational Standards will play a key role towards development of competent human resource for the Welding sector’s growth and development.

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Principal Secretary,

State Department for Technical and Vocational Education and Training,

# 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 (TVET) Act No. 29 of 2013 and Sessional Paper No. 4 of 2016 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET in order 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.

Incumbent welding and fabrication industry experts in conjunction with expert subject trainers and other related stakeholders have developed these Occupational Standards for Welder Level 3. These standards will be the basis for development of competency-based curriculum for Welder Level 3.

The Occupational Standards are designed and organized with clear performance criteria for each element of a unit of competency. These standards also outline the required knowledge and skills as well as evidence guide.

I am grateful to everyone who participated in the development of these Occupational Standards.

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Cabinet Secretary,

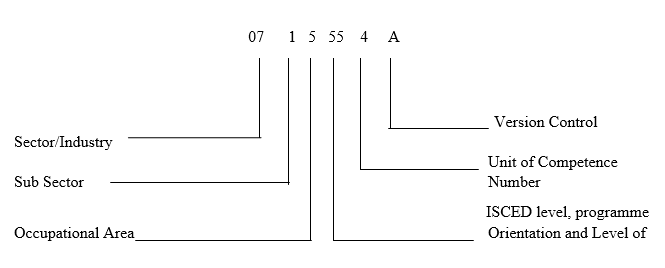
Ministry of Education, Science & Technology

# ABBREVIATIONS

KNQF Kenya National Qualifications Framework

MMAW Manual Metal Arc Welding

# KEY TO UNIT CODE



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# OVERVIEW

This document contains occupational standards designed to prescribe competences required for the qualification of Welder Level 3. These competences are required in order to Perform fabrication Processes I, arc welding Processes I, Gas welding, Soldering and brazing processes. The occupational standards consist of core units of competency as indicated hereafter.

# SUMMARY OF UNITS OF COMPETENCY

|  |  |
| --- | --- |
| **CORE UNITS OF COMPETENCY** | |
| 0715 251 01A | Perform Fabrication Processes I |
| 0715 251 02A | Perform Arc Welding Processes I |
| 0715 251 03A | Perform Gas welding, Soldering and Brazing processes |

# CORE UNITS OF COMPETENCY

# PERFORM FABRICATION PROCESSES I

**UNIT CODE:** 0715 251 01A

**UNIT DESCRIPTION**

This unit specifies competences required to perform fabrication processes I. The competences include carrying out bench work, sheet metal work and maintaining fabrication tools, machines and equipment.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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. Carry out bench work | * 1. Health and safety procedures are applied as per work requirement   2. Drawing is interpreted as per work requirement   3. Fabrication tools and equipmentare assembled as per work requirement   4. Fabrication ***material preparation*** is carried out as per job requirement   5. Work pieces up to 6 mm thickness are fitted as per task requirement   6. Housekeeping is carried out as per work place procedure. |
| 1. Carry out sheet metal work | * 1. Health and safety procedures are applied as per work requirement   2. Drawing is interpreted as per work requirement   3. Sheet metal tools and equipmentare assembled as per work requirement   4. Pattern development is performed as per task requirement   5. ***Sheet metal products*** are produced as per task requirement   6. Housekeeping is carried out as per work place procedure. |
| 1. Maintain fabrication tools, machines and equipment | * 1. Health and safety procedures are applied as per work requirement   2. Fabrication machines, tools and equipment for maintenance are identified as per work requirement   3. Fabrication machines, tools and equipment preventive maintenance is conducted as per manufacturer’s manual   4. Fabrication machines, tools and equipment are repaired as per manufacturer’s manual   5. Housekeeping is carried out as per work place procedure |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range**  **May include but not limited to;** |
| 1. Material preparation | * 1. Measuring   2. Marking out   3. Cutting   4. Surface preparation |
| 1. Sheet metal products | * 1. Doors   2. Windows   3. Gates |

**REQUIRED KNOWLEDGE AND SKILLS**

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

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Workplace procedures
* Templates development
* Health and safety
* Workplace housekeeping

**Required Skills**

The individual needs to demonstrate the following skills:

* + Critical thinking
  + Time management
  + Interpreting working drawings
  + Materials optimization
  + Workshop processes

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   * 1. Applied health and safety procedures as per work requirement   2. Carried outmaterial preparation as per job requirement   3. Fitted work pieces as per task requirement   4. Performed pattern development as per the task requirement   5. Produced sheet metal products as per task requirement   6. Conducted fabrication machines, tools and equipment preventive maintenance as per manufacturer’s manual   7. Carried out housekeeping as per work place procedure |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place   2. Access to relevant work environment   3. Resources relevant to the proposed activities or tasks |
| 1. Methods of assessment | Competency in this unit may be assessed through:   1. Practical 2. Projects 3. Third party report 4. Written tests |
| 1. Context of assessment | Competency may be assessed in the workplace or simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# PERFORM ARC WELDING PROCESSES I

**UNIT CODE:** O715 251 02A

**UNIT DESCRIPTION**

This unit specifies competences required to perform arc welding processes I. The competences include carrying out manual metal arc welding, arc cutting process and maintaining arc welding machines, tools and equipment.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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. Carry out manual metal arc welding | * 1. Health and safety procedures are applied as per work requirement   2. Drawing is interpreted as per work requirement   3. ***Arc welding machines, tools and equipment*** are assembled as per work requirement   4. Welding ***material preparation*** is carried out as per job requirement   5. ***Arc*** ***welding parameters*** are identified as per work requirement   6. Arc welding metals up to 6 mm thickness is performed in flat and horizontal positions as per work requirement.   7. Housekeeping is carried out as per workplace procedure |
| 1. Carry out arc cutting process | * 1. Health and safety procedures are applied as per work requirement   2. Drawing is interpreted as per work requirement   3. ***Machines, tools and equipment*** are assembled as per work requirement   4. Arc cutting material preparation is carried out as per job requirement   5. Arc cutting parameters are identified as per work requirement   6. Arc cutting of metals up to 6 mm thickness is performed in flat and horizontal positions as per work requirement   7. Arc cut product finishing is performed as per job requirement   8. Housekeeping is carried out as per workplace procedure |
| 1. Maintain arc welding machines, tools and equipment | * 1. Health and safety procedures are applied as per work requirement   2. Arc welding machines, tools and equipment preventive maintenance is conducted as per manufacturer’s manual   3. Faulty arc welding tools are repaired as per manufacturer’s manual   4. Housekeeping is carried out as per workplace procedure |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range**  **May include but not limited to;** |
| 1. Arc welding machines, tools and equipment include but not limited to: | * 1. Arc welding machines * AC arc welding machine * DC arc welding machine * AC/DC welding machine   1. Arc welding tools and equipment * Welding screens * Chipping hammer * Wire brushes * Fire extinguishers * Welding jigs and fixtures |
| 1. Material preparation include but not limited to: | * 1. Measuring   2. Marking out   3. Cutting   4. Edge preparation |
| 1. Arc welding parameters include but not limited to: | 1. Current 2. Arc length 3. Arc force |

**REQUIRED KNOWLEDGE AND SKILLS**

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

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* MMAW welding techniques
* Health and safety
* Workplace housekeeping
* Maintenance of welding machines
* Workplace procedures

**Required Skills**

The individual needs to demonstrate the following skills:

* + Critical thinking
  + Time management
  + Interpreting working drawings
  + Joint preparation
  + MMAW welding

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   * 1. Applied health and safety procedures as per work requirement   2. Carried out welding material preparation as per job requirement   3. Performed arc welding procedure as per work requirement.   4. Performed arc cutting procedure as per work requirement   5. Conducted arc welding machines, tools and equipment preventive maintenance as per manufacturer’s manual |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place   2. Access to relevant work environment   3. Resources relevant to the proposed activities or tasks |
| 1. Methods of assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Projects   3. Third party report   4. Written tests |
| 1. Context of assessment | Competency may be assessed in the workplace or simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# PERFORM BRAZING, SOLDERING AND GAS WELDING

**UNIT CODE:** 0715 251 03A

**UNIT DESCRIPTION**

This unit specifies competences required to perform brazing, soldering and gas welding. It involves carrying out gas welding, gas cutting, brazing, soldering and maintaining brazing, soldering and gas welding machines, tools and equipment.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  These describe the key outcomes which make up workplace functions | **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. Carry out gas welding | * 1. Occupational health and safety standards are observed as per work requirement   2. Working drawing is interpreted as per drawing standards   3. ***Gas welding machines, tools and equipment*** are assembled as per work requirement   4. Welding ***material preparation*** is carried out as per job requirement   5. Gas welding ***parameters*** are identified as per work requirement   6. Gas welding metals up to 16 mm thickness is performed in all positions as per job requirement   7. Gas weld ***inspection*** is carried out as per job requirement   8. Gas welded product finishing is performed as per job requirement   9. ***Housekeeping*** is carried out as per work procedure |
| * 1. Carry out gas cutting | * 1. Occupational health and safety standards are observed as per work requirement   2. Working drawing is interpreted as per drawing standards   3. Gas cutting tools and equipment are assembled as per work requirement   4. Gas cutting ***material preparation*** is carried out as per job requirement   5. ***Gas cutting parameters*** are identified as per work requirement   6. Gas cuttingof metals up to 16 mm thickness is performed in all positions as per job requirement   7. Gas cutting ***inspection*** is carried out as per job requirement   8. Gas cut product ***finishing*** is performed as per job requirement   9. ***Housekeeping*** is carried out as per work procedure |
| 1. Carry out brazing | * 1. Occupational health and safety standards are observed as per work requirement   2. Working drawing is interpreted as per job requirement   3. Brazing tools and equipmentare assembled as per work requirement   4. Brazing material preparation is carried out as per job requirement   5. Brazing ***parameters*** are identified as per work requirement   6. Brazing of metalup to 16 mm thickness is performed in all positionsas per job requirement   7. Brazing ***inspection*** is carried out as per job requirement   8. Brazing product finishing is performed as per job requirement   9. ***Housekeeping*** is carried out as per work procedure |
| 1. Carry out soldering | * 1. Occupational health and safety standards are observed as per work requirement   2. Working drawing is interpreted as per job requirement   3. ***Soldering tools and equipment*** are assembled as per work requirement   4. Soldering ***material preparation*** is carried out as per job requirement   5. Soldering parameters are identified as per work requirement   6. Soldering of metalsup to 16 mm thickness ***is*** performed in all positionsas per job requirement   7. Soldering ***inspection*** is carried out as per job requirement   8. Soldered product finishing is performed as per job |
| 1. Maintain brazing, soldering and gas welding machines, tools and equipment | * 1. Brazing, soldering and gas welding machines, tools and equipment for maintenance are identified as per work requirement   2. ***Preventive maintenance*** is conducted as per work procedure   3. ***Broken brazing, soldering and gas welding tools*** are repaired as per manufacturer’s manual   4. Preventive maintenance report is prepared as per work procedure |

**RANGE**

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

| **Variable** | **Range** |
| --- | --- |
| * + - 1. Gas welding machines, tools and equipment include but are not limited to: | 1.1 Gas welding equipment   * Oxygen cylinders * Acetylene cylinder * Propane cylinder * Gas welding torch   1.2 Gas welding tools   * + Fire extinguishers   + Welding jigs and fixtures   + Hoses   + Gas regulators   + Gauges   + Nozzle cleaner   1.3 Materials   * + Gas welding PPE   + Filler rods   + Plates   + Pipes   + Tubes |
| * + - 1. Material preparation include but are not limited to: | * 1. Measuring   2. Marking out   3. Cutting   4. Edge preparation   5. Joint preparation |
| * + - 1. Parameters include but are not limited to: | * 1. Working pressure   2. Oxygen-fuel ratio   3. Temperature |
| * + - 1. Inspection include but not limited to: | 5.1 Non-destructive   * Visual inspection * Ultrasonic inspection * Magnetic particle induction * Radiography inspection * Dye penetrant * Eddy current testing   5.2 Destructive   * Tensile test * Impact test * Corrosion test * Macro etching |
| * + - 1. Finishing includes but is not limited to: | * 1. Buffing   2. Polishing   3. Grinding   4. Blueing   5. Varnishing   6. Oil blacking   7. Bluing   8. Deburring   9. Electroplating   10. Enamelling   11. Painting |
| * + - 1. Housekeeping include but not limited to: | * 1. Hazard identification   2. Cleaning of the work area   3. Return of the tools to the storage area |
| * + - 1. Soldering tools and equipment include but are not limited to: | 19.1 Equipment   * Soldering gun * Propane gun * Soldering iron   19.2 Materials   * Soldering wire * Flux |
| * + - 1. Preventive maintenance | * 1. Cleaning of the external surfaces of the machine   2. Inspecting cables, connectors and power sources   3. Lubricating of moving parts   4. Replace consumables and spare parts   5. Ensuring proper cooling and ventilation |
| * + - 1. Broken brazing, soldering and gas welding tools | * 1. Soldering gun   2. Propane gun   3. Soldering iron |

**REQUIRED KNOWLEDGE AND SKILLS**

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

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Workplace procedures
* Gas welding and soldering equipment
* Joint preparation
* Gas welding and soldering techniques
* Welded joint standards
* Gas cutting techniques

**Required Skills**

The individual needs to demonstrate the following skills:

* + Interpreting working drawings
  + Preparing joints
  + Gas welding and soldering
  + Brazing
  + Gas cutting
  + Maintenance of gas welding machines

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical aspects of competency | Assessment requires evidence that the candidate:   * 1. Carried out gas welding material preparation as per job requirement   2. Performed gas welding of metals up to 16 mm thickness in all positions as per job requirement   3. Carried out gas cutting material preparation as per job requirement   4. Performed gas cutting of metals up to 16 mm thickness in all positions as per job requirement   5. Carried out brazing material preparation as per job requirement   6. Performed brazing of metals up to 16 mm thickness in all positions as per job requirement   7. Carried out soldering material preparation as per job requirement   8. Performed soldering of metals up to 16 mm thickness in all positions as per job requirement   9. Conducted preventive maintenance as per work procedure |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place   2. Access to relevant work environment   3. Resources relevant to the proposed activities or tasks |
| 1. Methods of assessment | Competency in this unit may be assessed through:   * 1. Oral questioning   2. Portfolio of evidence   3. Practical test   4. Third party report   5. Written tests   6. Project work |
| 1. Context of assessment | Competency may be assessed in the workplace or simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector and workplace job role is recommended. |