

**REPUBIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**MECHANICAL PRODUCTION (GRINDING AND FABRICATION OPERATIONS)**

**ARTISAN**

**LEVEL 4**



TVET CDACC

P.O BOX 15745-00100

NAIROBI

First published 2020

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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 of 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. 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 be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery allows 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 these Occupational Standards was developed for the purpose of developing a competency-based curriculum for Grinding and Fabrication Level 4. These Occupational Standards will also be the bases for assessment of an individual for competence certification.

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

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING MINISTRY OF EDUCATION**

# PREFACE

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Mechanical Sector Skills Advisory Committee (SSAC) have developed these Occupational Standards for a Grinding and fabrication Artisan. These standards will be the bases for development of a competency-based curriculum for Grinding and fabrication Level 4. These Standards will also be the bases for assessment of an individual for competence certification.

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 the Council Members, Council Secretariat, Mechanical Production SSAC, expert workers and all those who participated in the development of these National Occupational standards.

**Prof. CHARLES M. M. ONDIEKI, PhD, FIET (K), Con. Eng. Tech.**

**CHAIRMAN, TVET CDACC**

# ACKNOWLEDGMENT

These Occupational Standards were developed through combined effort of various stakeholders from private and public organizations. I am sincerely thankful to the management of these organizations for allowing their staff to participate in this course. I wish to acknowledge the invaluable contribution of industry players who provided inputs towards the development of these Standards.

I thank TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) for providing guidance on the development of these Standards. My gratitude goes to the Mechanical Production Engineering Sector Skills Advisory Committee (SSAC) members for their contribution to the development of these Standards. I thank all the individuals and organizations who participated in the validation of these Standards.

I acknowledge all other institutions which in one way or another contributed to the development of these Occupational Standards.

**CHAIRPERSON MECHANICAL PRODUCTION ENGINEERING SECTOR SKILLS ADVISORY COMMITTEE**

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# ACRONYMS

A Control Version

BC Basic Competencies

CC Common Competencies

CDACC Curriculum Development, Assessment and Certification Council

CR Core Competencies

CU Curriculum

EBK Engineers Board of Kenya

EBP Engineering best practice

EHS Environment, Health and Safety

ENG Engineering

IBMS Integrated Building Management System

IEE Institute of Electrical Engineers

KEBS Kenya Bureau of Standards

ME Mechanical Engineering

NCA National Construction Authority

OS Occupational Standards

OSHA Occupational Safety and Health Act

PPE Personal Protective Equipment

SOP Standard operating procedure

TVET Technical and Vocational Education and Training

WIBA Work injury benefits Act

**KEY TO UNIT CODE**

 **ENG/OS/ME/BC/01/4/A**

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

 Control Version

# OVERVIEW

Mechanical production (Grinding and fabrication) Level 4 qualification consists of competencies that a person must achieve to enable him/her to be certified as a grinding and fabrication artisan.

A Mechanical production (Grinding and fabrication) artisan is a person who will carry out grinding and fabrication duties using a given design and customer’s requirements. This work demands the artisan to read and interpret drawings in Mechanical production sector so that he/she can fabricate sheet metal parts and perform grinding on components according to the national and international standards.

Thus, the units of competency comprising grinding and fabrication level 4 qualification include the following basic, common and core competencies:

**BASIC COMPETENCIES**

|  |  |
| --- | --- |
| **Unit of Competency Code** | **Unit of Competency Title** |
| ENG/OS/ME/BC/01/4/A | Demonstrate communication skills |
| ENG/OS/ME/BC/02/4/A | Demonstrate numeracy skills |
| ENG/OS/ME/BC/03/4/A | Demonstrate digital literacy |
| ENG/OS/ME/BC/04/4/A | Demonstrate entrepreneurial skills |
| ENG/OS/ME/BC/05/4/A | Demonstrate employability skills |
| ENG/OS/ME/BC/06/4/A | Demonstrate environmental literacy |
| ENG/OS/ME/BC/07/4/A | Demonstrate occupational safety and health practices |

**COMMON COMPETENCIES**

|  |  |
| --- | --- |
| **Unit of Competency Code** | **Unit of Competency Title** |
| ENG/OS/ME/CC/01/4/A | Interpret basic technical drawing |
| ENG/OS/ME/CC/02/4/A | Use common metallic and non- metallic materials |
| ENG/OS/ME/CC/03/4/A | Perform bench work operations |

**CORE COMPETENCIES**

|  |  |
| --- | --- |
| **Unit of Competency Code** | **Unit of Competency Title** |
| ENG/OS/ME/CR/01/4/A | Fabricate sheet metal parts |
| ENG/OS/ME/CR/02/4/A | Perform grinding operations  |

# BASIC COMPETENCIES

# DEMONSTRATE COMMUNICATION SKILLS

**UNIT CODE:** ENG/OS/ME/BC/01/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to gather, interpret and convey information in response to workplace requirements and to lead in the dissemination and discussion of ideas, information and issues in the workplace.

**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. Obtain and convey workplace information
 | * 1. Specific and relevant information is accessed from ***appropriate sources***
	2. Effective questioning, active listening and speaking skills are used to gather and convey information
	3. Appropriate ***medium*** is used to transfer information and ideas
	4. Appropriate non- verbal communication is used
	5. Appropriate lines of communicationwith supervisors and colleagues are identified and followed
	6. Defined workplace procedures for the location and ***storage*** of information are used
	7. Personal interaction is carried out clearly and concisely
 |
| 1. Complete relevant work-related documents
 | * 1. Range of forms relating to conditions of employment are completed accurately and legibly
	2. Workplace data is recorded on standard workplace forms and documents
	3. Basic mathematical processesare used for routine calculations
	4. Errors in recording information on forms/ documents are identified and properly acted upon
	5. Reporting requirements to supervisor are completed according to organizational guidelines
 |
| 1. Communicate information about workplace processes
 | 1. Appropriate method of communication is selected

 1. Multiple operations involving several topics areas are communicated accordingly
2. Questions are used to gain extra information
3. Correct sources of information are identified
4. Information is selected and organized correctly
5. Verbal and written reporting is undertaken when required
6. Communication skills are maintained in all situations
 |
| 1. Lead workplace discussion
 | 1. Response to workplace issues are sought
2. Response to workplace issues are provided immediately
3. Constructive contributions are made to workplace discussions on such issues as production, quality and safety
4. Goals/objectives and action plan undertaken in the workplace are communicated accordingly
 |
| 1. Identify and communicate issues arising in the workplace
 | 1. Issues and problems are identified as they arise
2. Information regarding problems and issues are organized coherently to ensure clear and effective communication
3. Dialogue is initiated with appropriate personnel
4. Communication problems and issues are raised as they arise
 |

**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. ***Methods of communication*** include but not limited to:
 | * + Non-verbal gestures
	+ Verbal
	+ Face to face
	+ Two-way radio
	+ Speaking to groups
	+ Using telephone
	+ Written
	+ Internet
 |
| 1. ***Workplace discussion*** include but not limited to:
 | * + Coordination meetings
	+ Toolbox discussion
	+ Peer-to-peer discussion
 |

**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:

* Organize information
* Understand and convey intended meaning
* Participate in variety of workplace discussions
* Comply with organization requirements for the use of written and electronic communication methods
* Effective report writing
* Effective clarifying and probing skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Organization requirements for written and electronic communication methods
* Effective verbal communication methods
* Report writing
* Effective questioning techniques (clarifying and probing)
* Workplace etiquette

**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: 1.1 Dealt with a range of communication/information at one time 1.2 Made constructive contributions in workplace issues 1.3 Sought workplace issues effectively 1.4 Responded to workplace issues promptly 1.5 Presented information clearly and effectively in written form 1.6 Used appropriate sources of information 1.7 Asked appropriate questions 1.8 Provided accurate information |
| 1. Resource Implications
 | The following resources should be provided: 2.1 Variety of Information 2.2 Communication tools 2.3 Simulated workplace |
| 1. Methods of Assessment
 | 3.1 Case Study 3.2 Third-party reports3.3 Portfolio 3.4 Interview 3.5 Role Play |
| 1. Context of Assessment
 | Competency may be assessed individually in the actual workplace or through accredited institution |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE NUMERACY SKILLS**

**UNIT CODE:** ENG/OS/ME/BC/02/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to perform numerical functions.The person who is competent in this unit shall be able to: Identify and use whole numbers and simple fractions, decimals and percentages; Identify, measure and estimate familiar quantities for work, Read and use familiar maps, plans and diagrams for work, Identify and describe common 2D and some 3D shapes for work, Construct simple tables and graphs for work using familiar data, Identify and interpret information in familiar tables, graphs and charts for work.

**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. Identify and use whole numbers and simple fractions, decimals and percentages for work
 | 1. Simple fractions, decimals and percentages identified and interpreted
2. understanding of place value by organising numbers from smallest to largest demonstrated
3. Required numerical information located and decision made on appropriate method to solve a problem
4. Limited range of calculations performed using the 4 operations
5. Links between operations described
6. Estimations made to check reasonableness of results of problem solving process
7. Numerical information recorded, and the result of the task communicated using informal and some formal language and symbolism
 |
| 2. Identify, measure and estimate familiar quantities for work | 1. Measurement information in workplace tasks and texts identified and interpreted
2. Familiar units of measurement needed for tasks is identified
3. Familiar and simple amounts estimated
4. Appropriate measuring equipment selected
5. Simple measuring equipment graduated in familiar units to measure relevant quantities is used
6. Calculation done using familiar units of measurement
7. measurements and results checked against estimates
8. Results are recorded or reported
9. Results relevant to the workplace task are communicated using informal and some formal mathematical and general language
 |
| 3. Read and use familiar maps, plans and diagrams for work | 1. Items and places are in familiar maps, plans and diagrams
2. Common symbols and keys recognised in familiar maps, plans and diagrams
3. Understanding of direction and location demonstrated by describing the location of objects, or route to familiar places
4. Instructions to locate familiar objects or places are given and followed
5. Informal and some formal oral mathematical language and symbols are used
 |
| 4. Identify and describe common 2D and some 3D shapes for work | 1. Common 2D shapes and some common 3D shapes in familiar situations are identified and named
2. Common 2D shapes and designs are compared and classified
3. Informal and some formal language used to describe common two-dimensional shapes and some common three-dimensional shapes
4. Simple items used to draw or construct common 2D shapes
5. Common 3D shapes matched to their 2D sketches or nets
 |
| 5. Construct simple tables and graphs for work using familiar data | 1. Common types of graphs are identified and named
2. Familiar data to be collected is determined
3. A method to collect data is selected
4. A small amount of simple familiar data is collected
5. One or two variables determined from the data collected
6. Data ordered and collated
7. A table constructed, and data enter
8. Graphs are constructed using data from table
9. Results are promptly checked
10. Graph information related to work is reported or discussed using informal and some formal mathematical and general language
 |
| 6. Identify and interpret information in familiar tables, graphs and charts for work  | 1. Simple tables are identified in familiar texts and contexts
2. Title, headings, rows and columns located in familiar tables
3. Information and data in simple tables identified and interpreted
4. Information is related to relevant workplace tasks
5. Familiar graphs and charts are identified in familiar texts and contexts
6. Title, labels, axes, scale and key from familiar graphs and charts are located
7. Information and data in familiar graphs and charts is identified and interpreted
8. Information related to relevant workplace tasks
 |

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.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Simple measuring equipment
 | May include but not limited to:1.1 Rulers 1.2 Watches/clocks1.3 Scales1.4 Thermometers1.5 AVO meter |
| 1. Common 2D shapes and common 3D shapes
 | May include but not limited to:2.1 Round2.2 Square2.3 Rectangular2.4 Triangle2.5 Sphere2.6 Cylinder2.7 Cube2.8 Polygons2.9 Cuboids  |
| 3. Diagrammatical representation | May include but not limited to:1. Charts
2. Maps
3. Graphs
 |

**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:

* Applying Fundamental operations (addition, subtraction, division, multiplication)
* Using calculator
* Using different measuring tools

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Types of common shapes
* Differentiation between two dimensional shapes / objects
* Formulae for calculating area and volume
* Types and purpose of measuring instruments
* Units of measurement and abbreviations
* Fundamental operations (addition, subtraction, division, multiplication)
* Rounding techniques
* Types of fractions
* Different types of tables and graphs
* Meaning of graphs, such as increasing, decreasing, and constant value
* Preparation of basic data, tables & graphs

**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. Simple fractions, decimals and percentages are correctly identified and interpreted
	2. Performed a limited range of calculations using the 4 operations
	3. Performed calculations using familiar units of measurement
	4. Recognised common symbols and keys in familiar maps, plans and diagrams
	5. Constructed simple tables and graphs using familiar data
	6. Identified and interpret information in familiar tables, graphs and charts
 |
| 2. Resource Implications | 2.1 Calculator* 1. Basic measuring instruments
 |
| 1. Methods of Assessment
 | Competency may be assessed through:3.1 Written Test3.2 Interview/Oral Questioning* 1. Demonstration
 |
| 1. Context of Assessment
 | Competency may be assessed in an off the job setting  |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE DIGITAL LITERACY**

**UNIT CODE:** ENG/OS/ME/BC/03/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to effectively demonstrate digital literacy in a working environment. It entails identifying and using digital devices such as smartphones, tablets, laptops and desktop PCs for purposes of communication and performing work related tasks at the work place.

**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. Identify computer software and hardware
 | * 1. ***Appropriate computer software*** is identified according to manufacturer’s specification
	2. ***Appropriate computer hardware*** is identified according to manufacturer’s specification
 |
| 1. Apply security measures to data, hardware, software
 | * 1. ***Data security and privacy are classified*** in accordance with the technological situation
	2. ***Security and control measures*** are applied in accordance with laws governing protection of ICT
	3. Computer threats and crimes are detected.
	4. Protection against computer crimes is undertaken in accordance with laws governing protection of ICT
 |
| 1. Apply computer software in solving tasks
 | * 1. Basic ***word processing concepts*** are applied in resolving workplace tasks
	2. ***Word processing utilities*** are applied in accordance with workplace procedures
	3. Data is manipulated on worksheet in accordance with office procedures
 |
| 1. Apply internet and email in communication at workplace
 | * 1. Electronic mail is applied in workplace communication in accordance with office procedures
	2. Office internet functions are defined and executed in accordance with office procedures
	3. ***Network configuration*** and uses are determined in accordance with office operations procedures
 |

**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.

|  |  |
| --- | --- |
| **Range** | **Variable** |
| ***Appropriate computer software*** may include but not limited to: | * A collection of instructions that enable the user to interact with a *computer*, its hardware, or perform tasks.
* Computer tools that will help *computer* users interact with the hardware in a *computer.*
 |
| ***Appropriate computer hardware*** may include but not limited to: | Collection of physical parts of a computer system. This includes the computer case, monitor, keyboard, and mouse and all the parts inside the computer case, such as the hard disk drive, motherboard, video card, |
| ***Data security and privacy*** may include but not limited to: | * Confidentiality
* Cloud computing
* Confidentiality
* Cyber terrorism
* Integrity -but-curious data serving
 |
| ***Security and control measures*** may include but not limited to: | * Countermeasures and risk reduction
* Cyber threat issues
* Risk management
 |
| ***Word processing concepts*** may include but not limited to: | Using a special program to create, edit, and print documents |
| ***Network configuration*** may include but not limited to: | Organizing and maintaining information on the components of a computer network |

**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:

* Analytical skills
* Interpretation
* Typing
* Communication
* Computing (applying fundamental operations such as addition, subtraction, division and multiplication)
* Using calculator
* Basic ICT skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Input and output devices
* Central processing Unit (CPU)
* Peripherals
* Storage Media
* Software concept
* Types of concept
* Function of computer software
* Data security and privacy
* Security threats and control measures
* Computer crimes
* Detection and protection of computer crimes
* Laws governing protection of ICT
* Word processing;
* Functions and concepts of word processing.
* Documents and tables creation and manipulations
* Mail merging
* Word processing utilities
* Spread sheet;
* Meaning, formulae, function and charts, uses, layout, data manipulation and application to cell
* Networking and Internet;
* Meaning, functions and uses of networking and internet.
* Electronic mail and world wide web
* Emerging trends and issues in ICT;
* Identify and apply emerging trends and issues in ICT
* Challenges posed by emerging trends and issues

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. Identified input, output, CPU and storage media devices of computers in accordance to computer specification
	2. Identified concepts, types and functions of computer software according to operation manual
	3. Identified and controlled security threats
	4. Detected and protected computer crimes
	5. Applied word processing in office tasks
	6. Prepared work sheet and applied data to the cells in accordance to workplace procedures
	7. Used Electronic Mail for office communication as per workplace procedure
	8. Applied internet and World Wide Web for office tasks in accordance with office procedures
	9. Applied laws governing protection of ICT
 |
| 1. Resource Implications
 | * 1. Smartphones
	2. Tablets
	3. Laptops and
	4. Desktop PCs
	5. Desktop computer
	6. Lap top
	7. Calculator
	8. Internet
	9. Smart phone
	10. Operations Manuals
 |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Written Test
	2. Demonstration
	3. Practical assignment
	4. Interview/Oral Questioning
	5. Demonstration
 |
| 1. Context of Assessment
 | Competency may be assessed in an off and on the job setting |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE ENTREPRENEURIAL SKILLS**

**UNIT CODE:** ENG/OS/ME/BC/04/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required for creating and maintaining small scale business, establishing small business customer base, managing and growing a micro/small-scale business.

**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. Create and maintain small-scale business | 1.1 Generation and evaluation of business ideas is undertaken in accordance with the existing procedure 1.2 Competencies are matched with business opportunities in accordance with business practices.1.3 Procedure for starting a small business is identified as per the legal requirements1.4 SWOT/ PESTEL analysis and or industrial survey is carried out according to office procedures 1.5**Business operations** are monitored and controlled following established procedures. 1.6Quality assurance measures are implemented consistently. 1.7 Good relations are maintained with staff/workers. 1.8Policies and procedures on occupational safety and health and environmental concerns are constantly observed.  |
| 2. Establish small business customer base | 2.1 Good customer relations are maintained in accordance with office procedures2.2 New customers and markets are identified, explored and reached out to according to the marketing plan2.3 Promotions/Incentives are offered to loyal customers in accordance with office procedures 2.4 Additional products and services are evaluated and tried in accordance with marketing strategy2.5 Customer record is maintained in accordance with office procedures |
| 3. Manage small scale business  | 3.1 Enterprise is built up and sustained through judicious control of cash flows. 3.2 **Profitability of enterprise** is ensured though appropriate internal controls. 3.3 Unnecessary or lower-priority expenses and purchases are avoided to ensure profitability3.4 Basic cost-benefit analysis are undertaken in accordance with office procedures3.5 Basic financial management are undertaken in accordance with office procedures3.6 Basic financial accounting in undertaken in accordance with office procedures3.7 Business **internal controls** are implemented in accordance with office procedure3.8 Setting business priorities and strategies is carried out according to office procedures3.9 Preparation and interpretation of basic financial statements is undertaken in accordance with set procedures3.10*Preparation of business plans* for small business is undertaken in accordance with business strategy3.11 Business Social Responsibility is maintained in accordance with Standard Operations Procedures (SOP) |
| 4.Grow/ expand small scale business | 4.1 Prepared business growth strategy for small sale business in accordance with office procedures4.2 Incorporated technology in small scale business growth in accordance with technological trends 4.3 Emerging issues and trends are considered in accordance with business growth strategy4.4 Built audience interest in product/service according to growth strategy4.5 Boosted cooperate communication according to business **communication strategy** |

**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**  |
| **Business Strategy** include but not limited to: | Manage wastages, environmental conservation |
| **Business Operations** include but not limited to: | * Purchasing
* Accounting/administrative
* Work production/operations/sales
* Marketing
 |
| **Internal control** includes but not limited to: | * Accounting systems
* Financial statements/reports
* Cash management
* Human resource management
 |
| **Profitability of enterprise** include but not limited to: | Operating expenses lower than income |
| **Communication strategy** include but not limited to: | * Blue print of exchange of information
* Technology and exchange of information
 |

**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:

* Individual marketing skills
* Using basic advertising (posters/ tarpaulins, flyers, social media,
* Basic bookkeeping/ accounting skills
* Communication skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Generation and evaluation of business ideas
* Legal requirements for starting a small business
* SWOT/ PESTEL analysis
* Occupational Safety and Health
* Public relations concepts
* Business plan
* Business financing
* Marketing strategies
* Business management and control
* Production/ operation process
* Product promotion strategies
* Market and feasibility studies
* Business ethics
* Building customer relations
* Business models and strategies
* Types and categories of businesses
* Business internal controls
* Relevant national and local legislation and regulations
* Basic quality control and assurance concepts
* Building relations with customer and employees
* Building competitive advantage of the enterprise
* Business growth strategies

**EVIDENCE GUIDE**

|  |  |  |
| --- | --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate:

|  |
| --- |
| 1.1 Demonstrated entrepreneurial skills 1.2 Demonstrate competencies to create a small-scale business1.2 Demonstrated ability to conceptualize and plan a micro/small business 1.3 Grew customer base for the small-scale business1.3 Demonstrated ability to manage/operate a micro/small-scale business 1.4 Demonstrated competencies to grow a micro/small-scale business |

 |
| 1. Resource Implications
 |

|  |
| --- |
| The following resources should be provided:  |

2.1 Case studies on micro/small-scale enterprises 2.2 Materials and location relevant to the proposed activity and tasks  |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through:

|  |  |
| --- | --- |
| 3.1 Case studies3.2 Oral Questioning 3.3 Portfolio 3.4 Projects |  |

 |
| 1. Context of Assessment
 | 4.1 Competency may be assessed in workplace or in a simulated workplace setting 4.2 Assessment shall be observed while tasks are being undertaken whether individually or in-group |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE EMPLOYABILITY SKILLS**

**UNIT CODE:** ENG/OS/ME/BC/05/4/A

**UNIT DESCRIPTON**

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating critical safe work habits, demonstrating workplace learning and workplace ethics.

**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. Conduct self-management
 | 1. Personal vision, mission and goals are formulated based on potential and in relation to organization objectives
2. Emotions are managed as per workplace requirements
3. Individual performance is evaluated and monitored according to the agreed targets.
4. Assertiveness is developed and maintained based on the requirements of the job.
5. Accountability and responsibility for own actions are demonstrated.
6. Self-esteem and a positive self-image are developed and maintained.
7. Time management, attendance and punctuality are observed as per the organization policy.
8. Goals are managed as per the organization’s objective
9. Self-strengths and weaknesses are identified as per ***personal objectives***
10. Critics are managed as per personal objectives
11. Demonstrate interpersonal communication
12. Information is shared as per communication structure
13. Work activity is organized with other involved personnel as per the SOPs
 |
| 1. Demonstrate critical safe work habits
 | * 1. Stress is managed in accordance with workplace procedures.
	2. Punctuality and time consciousness is demonstrated in line with workplace policy.
	3. Personal objectives are integrated with organization goals based on organization’s strategic plan.
	4. Work priorities are set in accordance to workplace procedures.
	5. ***Feedback*** on performance is collected and evaluated based on established ***team*** learning process
	6. Leisure time is recognized in line with organization policy.
	7. Abstinence from ***drug and substance abuse*** is observed as per workplace policy.
	8. Awareness of HIV and AIDS is demonstrated in line with workplace requirements.
	9. Safety consciousness is demonstrated in the workplace based on organization safety policy.
	10. ***Emerging issues*** are dealt with in accordance with organization policy.
 |
| 1. Demonstrate workplace learning
 | * 1. Personal training needs are identified and assessed in line with the requirements of the job
	2. Own learning is managed as per workplace policy.
	3. Learning opportunities are sought and allocated based on job requirement and in line with organization policy.
	4. Contribution to the learning community at the workplace is carried out.
	5. ***Range of media for learning*** are identified as per the training need
	6. Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job
	7. Enthusiasm for ongoing learning is demonstrated
	8. Time and effort is invested in learning new skills-based job requirements
	9. Willingness to learn in different context is demonstrated based on available learning opportunities arising in the workplace.
	10. Opportunities for performance improvement are identified proactively in area of work.
	11. Awareness of personal role in workplace ***innovation*** is demonstrated.
 |
| 1. Demonstrate workplace ethics
 | * 1. Policies and guidelines are observed as per the workplace requirements
	2. Self-worth and profession is exercised in line with personal goals and organizational policies
	3. Code of conduct is observed as per the workplace requirements
	4. Personal and professional integrity is demonstrated as per the personal goals
	5. Commitment to jurisdictional laws is demonstrated as per the workplace requirements
 |

**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.

|  |  |
| --- | --- |
| **Range** | **Variable** |
| ***Drug and substance abuse*** includes but not limited to: | Commonly abused* Alcohol
* Tobacco
* Miraa
* Over-the-counter drugs
* Cocaine
* Bhang
* Glue
 |
| ***Feedback*** includes but not limited to: | * Verbal
* Written
* Informal
* Formal
 |
| ***Team*** includes but not limited to: | * Small work group
* Staff in a section/department
* Inter-agency group
 |
| ***Personal objectives*** include but not limited to: | * Long term
* Short term
* Broad
* Specific
 |
| ***Innovation*** include but not limited to: | * New ideas
* Original ideas
* Different ideas
* Methods/procedures
* Processes
* New tools
 |
| ***Emerging issues*** include but not limited to: | * Terrorism
* Social media
* National cohesion
* Open offices
 |
| ***Range of media for learning*** include but not limited to:  | * Mentoring
* peer support and networking
* IT and courses
 |

**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:

* Personal hygiene practices
* Intra and Interpersonal skills
* Communication skills
* Knowledge management
* Interpersonal skills
* Critical thinking skills
* Observation skills
* Organizing skills
* Negotiation skills
* Monitoring skills
* Evaluation skills
* Record keeping skills
* Problem solving skills
* Decision Making skills
* Resource utilization skills
* Resource mobilization skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Work values and ethics
* Company policies
* Company operations, procedures and standards
* Occupational Health and safety procedures
* Fundamental rights at work
* Personal hygiene practices
* Workplace communication
* Concept of time
* Time management
* Decision making
* Types of resources
* Work planning
* Resources and allocating resources
* Organizing work
* Monitoring and evaluation
* Record keeping
* Workplace problems and how to deal with them
* Negotiation
* Assertiveness
* Team work
* Gender mainstreaming
* HIV and AIDS
* Drug and substance abuse
* Leadership
* Safe work habits
* Professional growth and development
* Technology in the workplace
* Learning
* Creativity
* Innovation
* Emerging issues
	+ Social media
	+ Terrorism
	+ National cohesion

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. Conducted self-management
	2. Demonstrated critical safe work habits
	3. Demonstrated workplace learning
	4. Demonstrated workplace ethics
 |
| 1. Resource Implications
 |

|  |
| --- |
| The following resources should be provided:  |

* 1. Case studies/scenarios
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through: * Oral Interview
* Observation
* Third Party Reports
* Written
 |
| 1. Context of Assessment
 | * 1. Competency may be assessed in workplace or in a simulated workplace setting
	2. Assessment shall be observed while tasks are being undertaken whether individually or in-group
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE ENVIRONMENTAL LITERACY**

**UNIT CODE:** ENG/OS/ME/BC/06/4/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to follow procedures for environmental hazard control, follow procedures for environmental pollution control, comply with workplace sustainable resource use and evaluate current practices in relation to resource usage.

**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. Control environmental hazard
 | * 1. ***Storage methods*** for environmentally hazardous materials are strictly followed according to environmental regulations and OSHS.
	2. ***Disposal methods*** of hazardous wastes are followed always according to environmental regulations and OSHS.
	3. ***PPE*** is used according to OSHS.
 |
| 1. Control environmental Pollution control
 | * 1. Environmental pollution ***control measures*** are compiled following standard protocol.
	2. Procedures for solid waste management are observed according Environmental Management and Coordination Act 1999
	3. Methods for minimizing ***noise pollution*** complied following environmental regulations.
 |
| 1. Demonstrate sustainable resource use
 | * 1. Methods for minimizing wastage are complied with.
	2. Waste management procedures are employed following principles of 3Rs (Reduce, Reuse, Recycle)
	3. Methods for economizing or reducing resource consumption are practiced.
 |
| 1. Evaluate current practices in relation to resource usage
 | * 1. Information on resource efficiency ***systems and procedures*** are collected and provided to the work group where appropriate.
	2. Current resource usage is measured and recorded by members of the work group.
	3. Current purchasing strategies are analyzed and recorded according to industry procedures.
	4. Current work processes to access information and data is analyzed following enterprise protocol.
 |

**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.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| PPE may include but are not limited to: | * + Masks
	+ Gloves
	+ Goggles
	+ Safety hat
	+ Overall
	+ Hearing protector
	+ Safety boots
 |
| Environmental pollution control measures may include but are not limited to: | * + Methods for minimizing or stopping spread and ingestion of airborne particles
	+ Methods for minimizing or stopping spread and inhaling gases and fumes
	+ Methods for minimizing or stopping spread and ingestion of liquid wastes
 |
| Waste management Procedures may include but are not limited to: | * Sorting
* Storing of items
* Recycling of items
* Disposal of items
* Handling
* Transport
 |
| Resources may include but are not limited to: | * + Electric
	+ Water
	+ Fuel
	+ Telecommunications
	+ Supplies
	+ Materials
 |
| Workplace environmental hazards may include but are not limited to: | * Biological hazards
* Chemical and dust hazards
* Physical hazards
 |
| Organizational systems and procedures may include but are not limited to:  | * Supply chain, procurement and purchasing
* Quality assurance
* Making recommendations and seeking approvals
 |

**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:

* Following storage methods of environmentally hazardous materials
* Following disposal methods of hazardous wastes
* Using PPE
* Practicing OSHS
* Complying environmental pollution control
* Observing solid waste management
* Complying methods of minimizing noise Pollution
* Complying methods of minimizing wastage
* Employing waste management procedures
* Economizing resource consumption
* Listing of resources used
* Measuring current usage of resources
* Identifying and reporting workplace environmental hazards
* Conveying all environmental issues
* Following environmental regulations
* Identifying environmental regulations
* Assessing procedures for assessing compliance
* Collecting information on environmental and resource efficiency systems and procedures, and Providing information to the work group
* Measuring and recording current resource usage
* Analysing and recording current purchasing strategies.
* Analysing current work processes to access information and data and Assisting identifying areas for improvement

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Storage methods of environmentally hazardous materials
* Disposal methods of hazardous wastes
* Usage of PPE Environmental regulations
* OSHS
* Types of pollution
* Environmental pollution control measures
* Different solid wastes
* Solid waste management
* Different noise pollution
* Methods of minimizing noise pollution
* Solid Waste Act
* Methods of minimizing wastage
* Waste management procedures
* Economizing of resource consumption
* Principle of 3Rs
* Types of resources
* Techniques in measuring current usage of resources
* Calculating current usage of resources
* Types of workplace environmental hazards
* Environmental regulations
* Environmental regulations applying to the enterprise.
* Procedures for assessing compliance with environmental regulations.
* Collection of information on environmental and resource efficiency systems and procedures,
* Measurement and recording of current resource usage
* Analysis and recording of current purchasing strategies.
* Analysis current work processes to access information and data Analysis of data and information
* Identification of areas for improvement

**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:1.1 Controlled environmental hazard 1.2 Controlled environmental pollution 1.3 Demonstrated sustainable resource use1.4 Evaluated current practices in relation to resource usage |
| 1. Resource Implications
 | The following resources should be provided:* 1. Workplace with storage facilities
	2. Tools, materials and equipment relevant to the tasks (ex. Cleaning tools, cleaning materials, trash bags, etc.)
	3. PPE
	4. Manuals and references
	5. Legislation, policies, procedures, protocols and local ordinances relating to environmental protection
	6. Case studies/scenarios relating to environmental Protection
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through:3.1 Demonstration3.2 Oral questioning3.3 Written examination3.4 Third Party Reports3.5 Portfolio (citations/awards from GOs and NGOs, certificate of training – local and abroad)3.6 Simulations and role-plays |
| 1. Context of Assessment
 | Competency may be assessed on the job, off the job or a combination of these as well as in work placement (internship). Off the job assessment must be undertaken in a closely simulated workplace environment.  |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE OCUPATIONAL SAFETY AND HEALTH PRACTICES**

 **UNIT CODE:** ENG/OS/ME/BC/07/4/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to practice safety and health, and comply with OSH requirements relevant to work

**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. Observe workplace procedures for hazards and risk prevention
 | 1.1 Arrangement of work area and items in accordance with  Company housekeeping procedures is followed 1.2 Work standards and procedures are followed1.3 ***Prevention and control measures***, including use of ***safety***  ***gears/PPE*** are applied 1.4 Standards and procedures for ***incidents and emergencies*** are studied and applied, as needed |
| 1. Participate in arrangements for workplace safety and health maintenance
 | 2.1 Orientations on ***OSH requirements/regulations*** of tasks is  participated2.2 Feedback on health, safety, and security concerns are provided to appropriate personnel as required in a sufficiently detailed manner. 2.3 Workplace procedures for reporting hazards, incidents, injuries and sickness are practiced2.4 OSH requirements/ regulations and workplace safety and hazard control procedures are reviewed, and compliance reported to appropriate personnel, as needed2.5 Needed ***OSH-related trainings*** are identified and proposed to appropriate personnel |

**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.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. ***Prevention and control measures*** may include but are not limited to:
 | 1.1 Eliminate the hazard (i.e., get rid of the dangerous machine1.2 Isolate the hazard (i.e. keep the machine in a closed room and operate it remotely; barricade an unsafe area off)1.3 Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one)1.4 Use administrative controls to reduce the risk (i.e. give trainings on how to use equipment safely; OSH-related topics, issue warning signages, rotation/shifting work schedule)1.5 Use engineering controls to reduce the risk (i.e. use safety guards to machine)1.6 Use personal protective equipment1.7 Safety, Health and Work Environment Evaluation* 1. Periodic and/or special medical examinations of workers
 |
| 1. ***Safety gears /PPE*** (Personal Protective Equipment’s) may include but are not limited to:
 | 2.1 Arm/Hand guard, gloves2.2 Eye protection (goggles, shield) 2.3 Hearing protection (ear muffs, ear plugs)2.4 Hair Net/cap/bonnet2.5 Hard hat2.6 Face protection (mask, shield)2.7 Apron/Gown/coverall/jump suit2.8 Anti-static suits2.9 High-visibility reflective vest |
| 1. ***Incidents and emergencies*** may include but are not limited to:
 | 3.1 Chemical spills3.2 Equipment/vehicle accidents3.3 Explosion3.4 Fire3.5 Gas leak3.6 Injury to personnel3.7 Structural collapse* 1. Toxic and/or flammable vapors emission.
 |
| 1. ***OSH requirements / regulations*** may include but are not limited to:
 | 4.2 Building code4.5 Permit to Operate |
| 1. ***OSH-related trainings*** may include but are not limited to:
 | 5.1 Safety Orientations relevant to tasks5.2 Safe and Correct Operation of Tools and Equipment5.3 Health Orientations/trainings (Healthy Lifestyle, Prevention of drug/alcohol dependence, violence in the workplace, work-stress)5.4 Prevention and Control of OSH Hazards in the workplace5.5 Chemical Handling5.6 Safety Trainings (Fire Safety, Construction Safety, Confined Space)5.7 Prevention and Control of Work-related Injuries and Illness5.8 Basic First-aid Trainings5.9 Emergency Response Trainings5.10 Trainings on use of fire-extinguisher |

**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:

* Communication Skills
* Knowledge management
* Collaborating skills
* Interpersonal Skills
* Troubleshooting skills
* Critical thinking Skills
* Observation Skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* General OSH principles and legislations
* Principles of good housekeeping (5S)
* Company/workplace policies/ guidelines
* Standards and safety requirements of work process and procedures
* Standard Workplace emergency plan and procedures
* Safety and health requirements of tasks
* Workplace guidelines on providing feedback on OSH and security concerns
* OSH regulations
* Hazard control procedures
* OSH trainings relevant to work

**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:1.1 Follows work and housekeeping procedures, and complies with its requirements1.2 Follows work standards and procedures1.3 Applies OSH preventive and control measures, including emergency plan, standards and procedures1.4 Participates in orientations on OSH requirements of tasks1.5 Provides feedback on health, safety, and security concerns in a sufficiently detailed manner.1.6 Practices workplace procedures for reporting hazards, incidents, injuries and sickness1.7 Reviews and reports compliance to workplace OSH regulations and hazard control procedures1.8 Identifies and proposes OSH trainings relevant to work |
| 1. Resource Implications
 | The following resources should be provided:2.1 Facilities, materials tools and equipment necessary for the activity |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through:3.1 Observation/Demonstration with oral questioning3.2 Third party report3.3 Written exam |
| 1. Context of Assessment
 | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment.  |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# COMMON COMPETENCY

# **INTERPRET BASIC TECHNICAL DRAWINGS**

**UNIT CODE:** ENG/OS/ME/CC/01/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required by a mechanical production artisan to interpret basic technical drawings. It involves competencies to: select and use drawing instruments and materials, interpret plain geometry drawings, solid geometry drawings, pictorial and orthographic drawings and mechanical drawings to help in grinding and fabrication of components.

**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 italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Use drawing instruments and materials
 | * 1. ***Personal Protective Equipment*** is used according to occupational safety and health regulations
	2. ***Drawing instruments*** are identified and gathered according to task requirements
	3. ***Drawing materials*** are identified and gathered according to task requirements
	4. Drawing instruments are used as per the task specification
	5. Drawing instruments are maintained as per manufacturer’s instructions
	6. Drawing materials are used as per workplace procedures
	7. Waste materials are disposed in accordance with workplace procedures and ***environmental legislations***
 |
| 1. Interpret plane geometry drawings
 | * 1. Different lines used in drawing are identified according to standard drawing conventions
	2. Different ***geometric forms*** are constructed according to standard conventions
	3. Different angles are measured using appropriate measuring tools
	4. Angles are bisected according to ***standard conventions***
	5. Freehand sketching of different geometric forms, tools, equipment, diagrams is conducted
 |
| * 1. Interpret solid geometry drawings
 | 1. Drawings of patterns are interpreted according to standard conventions
2. Patterns are developed in accordance with drawing specification
 |
| 1. Interpret orthographic and pictorial drawings
 | * 1. Drawing symbols, abbreviations are interpreted according to standard drawing conventions
	2. First and third angle orthographic drawings produced in accordance with the ***standard conventions***
	3. Orthographic elevations are dimensioned in accordance with standard conventions
	4. Isometric drawings are produced in accordance with standard conventions
 |
| 1. Produce mechanical drawings
 | * 1. Mechanical symbols and abbreviations are interpreted according to workplace procedures.
	2. ***Mechanical drawings*** are produced in accordance with workplace procedures.
 |

**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.

| **Variable** | **Range** |
| --- | --- |
| Personal Protective Equipment includes but not limited to: | Dust coats, safe closed leather shoes |
| Drawing instrument includes but not limited to: | Drawing boards, T and set squares, drawing sets, curves, protractor and ruler, computers with CAD packages and a scientific calculator. |
| Drawing materials includes but not limited to: | Drawing papers, pencils, erasers, masking tapes, paper clips |
| Environmental legislations include but not limited to: | EMCA 1999 |
| Geometric forms includes but not limited to: | Circles, triangles, rectangles, parallelogram, polygons, pyramids, conic sections, prisms, loci |
| Standard conventions include but not limited to: | * Anatomy of engineering drawing (title block, coordinate grid system, revision block, notes and legends)
* Drawing scale (paper size and drawing symbols)
* International drawing standards
 |
| Mechanical drawings includes but not limited to: | Block, schematic and line diagrams |

**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
* Basic numeracy
* Drawing skills
* Interpretation
* Safe handling of drawing equipment.
* Analysis and synthesis
* Communication skills
* Inter personal skills

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Drawing equipment and materials
* Freehand sketching
* Lettering
* Geometrical constructions
* Types of drawings
* Types of lines
* Isometric drawing conventions, features, characteristics, components
* Orthographic drawing conventions, features, characteristics, components
* Sketches and drawings of simple patterns

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Used ***Personal Protective Equipment*** according to occupational safety and health regulations
	2. Used drawing instruments as per the task specification
	3. Used drawing materials as per workplace procedures
	4. Identified different lines used in drawing according to standard drawing conventions
	5. Conducted freehand sketching of different geometric forms, tools, equipment and diagrams
	6. Developed patterns in accordance with drawing specification
	7. Produced first and third angle orthographic drawings in accordance with the standard conventions
	8. Produced isometric drawings in accordance with standard conventions
	9. Produced mechanical drawings in accordance with workplace procedures.
 |
| 1. Resource Implications
 | Resources common to the workplace are advised to be applied.* 1. Drawing room
	2. Drawing instruments and materials
	3. Teaching models
 |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Practical assessment
	2. Observation
	3. Oral assessment
	4. Written test assessment
 |
| 1. Context of Assessment
 | Competency may be assessed individually in the actual workplace or a simulated work place setting |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# USE COMMON METALLIC AND NON-METTALIC MATERIALS

**UNIT CODE:** ENG/OS/ME/CC/02/4/A

**UNIT DESCRIPTION:**

This unit covers the unit of competency required by a mechanical production artisan to use common metallic and non-metallic materials. It involves competencies required to: identify properties of engineering materials, identify ore extraction processes, identify methods of producing engineering materials, perform heat treatment and prevent material corrosion.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** These describe the keyoutcomes which make upworkplace 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. Identify properties of engineering materials
 | * 1. Engineering materials type is identified as per the application
	2. ***Physical properties*** of engineering material are determined
	3. ***Mechanical properties*** of engineering materials are tested
	4. Crystal structure of materials are identified
 |
| 1. Identify ore extraction processes of metallic materials
 | 1. Safety procedures to be observed are identified according to workplace procedures.
2. Method of extraction is outlined as per ***metal classification***
3. Procedure in extraction process is outlined as per extraction method
4. Extraction by- products are identified as per material extraction method
 |
| 1. Identify methods of producing engineering materials
 | 1. ***Methods of producing different nonmetallic materials*** are identified according to the type of material
2. Forms of supply of engineering materials are identified according to their application
3. ***Finishing and*** ***Refinement*** processes are identified based on material required.
 |
| 1. Perform heat treatment
 | * 1. Safety requirements associated with heat treatment are observed in accordance to workplace procedures.
	2. Tools, equipment and materials used for heat treatment are selected according to manufacturer’s specification and workplace procedures
	3. **Heat treatment processes** are identified as per the job specification and workplace procedures
	4. Heat treatment of metals is performed as per the job specification and workplace procedures
 |
| 1. Prevent material corrosion
 | * 1. Safety rules and regulations are observed during corrosion prevention in material in accordance to workplace procedures.
	2. ***Types of corrosion*** are identified as per the application of the material
	3. Agents of corrosion are identified as per the corrosion type
	4. ***Methods of corrosion prevention*** are identified as per the application of the material
	5. Corrosion prevention is performed as per the job specification and application area.
 |

**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.

| **VARIABLE** | **RANGE** |
| --- | --- |
| Physical properties includes but not limited to: | * Density
* Color
* Texture
* Melting point
* Thermo conductivity
* Electrical resistivity
 |
| Mechanical properties includes but not limited: | * Ductility
* Malleability
* Elasticity
* Toughness
* Hardness
* Brittleness
* Plasticity
* Strength
 |
| Metal classification includes: | * Ferrous metals
* Non-ferrous metals
 |
| Methods of producing different nonmetallic materials | * Powder mettallurgy
* Extrusion
* Blowing
* Casting
 |
| Different nonmetallic materials include but not limited to: | * + Rubber
	+ Plastics
	+ Wood
	+ ceramics
	+ Glass
 |
| Finishing processes includes but not limited to: | * + Lapping
	+ Fine grinding
	+ Polishing
 |
| Heat treatment processes includes but not limited to: | * + Annealing
	+ Tempering
	+ Normalizing
	+ Hardening
	+ Case hardening
 |
| Corrosion types includes but not limited to: | * + Galvanic
	+ Stress corrosion cracking
 |
| Methods of corrosion prevention includes but not limited to: | * + Painting
	+ Electroplating
	+ Galvinizing
	+ Cathodic
	+ Chromizing
 |

**REQUIRED KNOWLEDGE AND SKILLS**

The individual needs to demonstrate the following skills

**Required Skills**

* Measuring and marking
* Material inspection and testing
* Analytical skills
* Communication skills
* Occupational health and safety regulations
* Heat treatment skills
* Corrosion prevention
* Problem solving skills
* Use of hand tools

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

***The individual needs to demonstrate knowledge and understanding of:***

* Occupational Health and Safety Act of Kenya laws 2007 with focus on personal safety, machine safety and workplace
* National Environment Management Authority Act, Kenya 2004
* OSH ACT 2007
* Forms of material supply
* Heat treatment processes
* Corrosion formation and prevention
* Equipment manuals
* Metallurgy and materials
* Inspection and testing
* WIBA ACT
* Report writing

**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 learner* 1. Identified safety procedures to be observed according to workplace procedures.
	2. Determined physical properties of engineering material as per the workplace requirements
	3. Tested mechanical properties of engineering materials as per the workplace requirements
	4. Outlined procedure in extraction process as per extraction method
	5. Identified forms of supply of engineering materials according to their application
	6. Performed heat treatment of metals as per the job specification and workplace procedures
	7. Identified agents of corrosion as per the corrosion type
	8. Performed corrosion prevention as per the job specification and application area
 |
| 1. Resource Implications
 | * 1. Testing materials
	2. Measuring instruments
	3. Heat treatment equipment (furnaces, oxy-fuel gas system etc.)
	4. Inspection tools
 |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Oral questioning
	2. Written test
	3. Practical assessment
 |
| 1. Context of Assessment
 | Competency may be assessed individually in the actual workplace or through accredited institution |
| 1. Guidance information for assessment
 | Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended. |

# PERFORM BENCH WORK OPERATIONS

**UNIT CODE:** ENG/OS/ME/CC/3/04/A

**UNIT DESCRIPTION**

The Mechanical production artisan will be able to perform bench work operations using basic hand tools while observing occupational safety and health legislations, regulations and safe working practices. In the context of the standards, the learner is to plan work operations, mark out work pieces, set up work pieces on holding devices, assemble metal parts and their sub-assemblies, inspect the work for accuracy and organize the work area.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** These describe the keyoutcomes which make upworkplace 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. Observe safety rules and regulations
 | * 1. Prescribed personal safety gear is worn as per work place procedure.
	2. Prescribed safety measures for the operation of hand tools and bench drilling machines adhered to as per safety rules and regulations (OSHA)
	3. Prescribed safe work environment is observed as per rules and regulations
 |
| 1. Plan work operations
 | * 1. Working drawings are interpreted as per ***drawing standards.***
	2. Operation Plan is produced as per the working drawings.
	3. Tools and equipment are selected as per the operation plan.
 |
| 1. Mark out dimensions on work pieces
 | 1. Measuring tools for the work are selected
2. Measuring tools are inspected and calibrated as per the workplace procedures
3. Marking out tools are selected as per the operation plan
4. Dimensions are marked on the work piece as per the working drawing specifications
 |
| 1. Set up work pieces on holding devices
 | * 1. Work piece is mounted on work holding devices
	2. Work piece is clamped securely on ***work holding devices***
 |
| 1. Use hand tools
 | * 1. ***Hand tools*** are selected based on operation plan
	2. Work piece is cut to specification
 |
| 1. Use bench drill
 | * 1. Hole centers are marked and center punched as per operation plan.
	2. Drill bits are selected and mounted on the machine spindle
	3. Work piece is mounted on holding device and clamped
	4. ***Hole is drilled*** to specification
	5. Hole is inspected to specification
 |
| 1. Assemble metal parts and sub-assemblies
 | * 1. Fitted parts are ***joined*** andassembled as per the working drawing specifications
	2. Final assembly inspected as per specification
 |
| 1. Inspect finished work
 | * 1. Inspection tools and methods are selected as per operation plan
	2. Finished work is inspected as per specification
	3. Adjustments are made based on inspection results
 |
| 1. Maintain hand tools and equipment
 | * 1. Tools and equipment are inspected as per the workplace procedures
	2. Faults on equipment and tools are identified and reported as the workplace procedures
	3. Tools and equipment are lubricated as per the workplace procedures
 |
| 1. Perform housekeeping
 | * 1. Work environment is cleaned as per the workplace procedures
	2. Waste is segregated and disposed as per the workplace environmental regulations
	3. Tools and equipment are stored as per the workplace procedures
 |

**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.

|  |  |
| --- | --- |
| **VARIABLE**  | **RANGE**  |
| Measuring tools may include but not limited to:  | * + Steel rule
	+ Vernier caliper
	+ Micrometer screw gauge
	+ Vernier height gauge
 |
| Drawing Standards may include but not limited to:  | * + ISO
	+ BS
	+ ANSI
 |
| Marking out tools may include but not limited to:  | * + Scribers
	+ Dividers
	+ Dot punch
	+ Centre punch
	+ Engineers square
	+ Straight edge
	+ Surface plate
 |
| Work holding devices may include but not limited to:  | * + Bench vice
	+ V-Block
	+ Angle plate
	+ G-clamp
	+ Jigs and fixtures
	+ Hand vice
 |
| Hand tools may include but not limited to:  | * + Files
	+ Saws
	+ Hammers
	+ Chisels
	+ Taps and dies
 |
| Hole drilled may include but not limited to:  | * + Location
	+ Counter sinking
	+ Counter boring
	+ Reaming
	+ Boring
 |
| Joining methods may include but not limited to:   | * + Riveting
	+ Use of mechanical fasteners
	+ Use of adhesives
	+ Soldering
	+ Brazing
	+ Welding (gas/arc)
 |
| Specifications may include but not limited to:  | * + Dimensions
	+ Tolerances
	+ Geometry
	+ Surface finish
	+ Functionality
 |

**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:

* Interpreting Technical drawing
* Using measuring and inspection tools
* Using hand tools
* Using portable and bench drilling machines
* Soldering and brazing
* Riveting and fastening
* House keeping
* Observing safety rules and regulation
* Work planning
* Time management
* Problem solving
* Communication skills

 **Required Knowledge**

 The individual needs to demonstrate knowledge and understanding of:

* Occupational Health and Safety Act of Kenya laws 2007 with focus on personal safety, machine safety and workplace
* National Environment Management Authority Act, Kenya 2004
* Equipment manuals
* Basic technical drawing complying to ISO, ANSI & BS standards
* ISO 1101 Geometrical tolerance and where to use the norm
* Work Planning and documentation
* Measuring tools
* Hand tools
* Bench work
* Portable and bench drilling machines
* Metal joining methods
* Housekeeping procedures
* Inspection and quality control
* Preventive maintenance of machine tools
* Metal cutting technology
* Materials and metallurgy
* WIBA act (2007)
* Report writing

**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 learner: * 1. Adhered to prescribed safety measures for the operation of hand tools and bench drilling machines as per safety rules and regulations standards (OSHA)
	2. Produced Operation Plan as per the working drawings
	3. Marked dimensions on the work piece as per the working drawing specification
	4. Clamped work piece securely on work holding devices
	5. Cut work piece to specification
	6. Drilled holeto specification
	7. Joined and assembled the fitted parts as per the working drawing specifications
	8. Inspected finished work as per the specification
	9. Cleaned work environment as per the workplace procedures
	10. Stored tools and equipment as per the workplace procedures
 |
| 1. Resource Implications
 | * 1. Hand measuring tools
	2. Hand marking tools
	3. Inspection tools and equipment
	4. Hand drilling machine
	5. Bench Drilling machine
	6. Work benches
	7. Bench vices
	8. ISO, BS and ANSI standards
	9. Rules and procedures
	10. Resource materials, manuals for bench, tools and equipment
	11. Materials
	12. Cutting tools
 |
| 1. Methods of Assessment
 | Competency may be assessed through: * 1. Observing the behavior of the learner
	2. Oral presentations
	3. Inspection of written operation procedures
	4. Inspection of finished product
	5. Observing housekeeping of the work area and/or machine tool
 |
| 1. Context of Assessment
 | Competency may be assessed individually in the actual workplace or through accredited institution  |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.  |

# CORE COMPETENCIES

#

# FABRICATE SHEET METAL PARTS

**UNIT CODE:** ENG/OS/ME/CR/01/04/A

**UNIT DESCRIPTION**

This unit covers the competencies required by a Mechanical production (Grinding and Fabrication Operations) artisan to fabricate sheet metal parts. It includes competencies that ensure the learner will: observe safety rules and regulations, identify sheet metal tools & Equipment, read and interpret working drawing, mark out, set up sheet metal fabrication machines and equipment, fabricate sheet metal components, assess quality of components, maintain sheet metal fabrication tools, machine and equipment and perform housekeeping

**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. Observe safety rules and regulations

 | * 1. Personal safety gear is worn as per work place procedure.
	2. Safe work environment is observed as per rules and regulations.
	3. Workplace procedures are adhered to.
 |
| 1. Use sheet metal machines, tools & equipment.
 | * 1. ***Sheet metal machines, tools*** and equipment are identified as per job requirements.
	2. Sheet metal machines, tools and equipment selected as per the operation plan
	3. Sheet metal machine, tools and equipment used as per manufacturer’s specification manual.
 |
| 1. Plan work operation
 | * 1. Technical drawings and geometric symbols are read and interpreted as per ***drawing standards***.
	2. ***Operation Plan*** is prepared as per the working drawings.
	3. Pattern development layout is sketched as per the work specification
 |
| 1. Mark out work pieces
 | * 1. Marking and measuring tools are selected as per

 specifications * 1. Work piece dimensions are measured as per the specifications
	2. Dimensions are marked on work piece as per the ***drawing specifications***
 |
| 1. Set- up sheet metal machine
 | * 1. Machine, tools and equipment are selected as per

 operation plan * 1. Attachmentsaremounted as per machine operational

 manual  |
| 1. Fabricate sheet metal parts
 | * 1. Sheet metal work pieces produced as per operation plan
1. Sheet metal parts joined as per the specifications
 |
| 1. Inspect finished work piece
 | 1. Finished work piece is cleaned according to work place

procedures1. Finished work piece is inspected to specification
2. Finished work piece is tested for function ability as per the Specifications
 |
| 1. Maintain sheet metal machines, tools and equipment
 | 1. Machines, tools and equipment cleaned as per the work place procedures
2. Machines and tools are inspected as per the work place procedures
3. Faults on machines and tools are identified and reported as per the workplace procedures
4. Machines and equipment are lubricated as per the

manufacturers manual |
| 1. Perform housekeeping
 | 1. Work environment cleaned in accordance with work

place procedures1. Waste is segregated and disposed as per the work place environmental procedures
2. Tools and equipment are stored as per the workplace

Procedures |
| 1. Prepare reports
 | 1. Any defects/deviations are reported according to workplace procedures.
2. Any cost variations are reported as per workplace procedures.
3. Accidents and incidents are reported according to workplace procedure
 |

**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.

|  |  |
| --- | --- |
| **Variable**  | **Range**  |
| Sheet metal machine tools include but not limited to:  | * + Rolling Machine
	+ Bending machine
	+ Punching machine
	+ Shearing machine
 |
| Drawing Standards includes but not limited to:  | * + ISO
	+ BS
	+ ANSI
 |
| Operation Plan includes but not limited to:   | * + Sequence of operations
	+ Measuring tools
	+ Hand tools
	+ Cutting tools
	+ Inspection tools
 |
| Drawing specifications includes but not limited to:  | * + Dimensions
	+ Tolerances
	+ Geometry
	+ Surface finishing
	+ Functionality
	+ Visual inspection
 |

**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:

* Technical drawing
* Sheet metal development
* Soldering
* Welding
* Seaming
* Riveting
* Bolting
* brazing
* Use of the Guillotine, bending and rolling machines
* Use of hand tools to cut, fold and form sheet metal
* Production of holes in sheet metal
* Measuring and marking out

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Occupational Health and Safety Act of Kenya laws 2007 with focus on personal safety, machine safety and workplace
* National Environment Management Authority Act, Kenya 2004
* OSH act
* Equipment manuals
* Technical drawing complying to ISO, ANSI & BS standards
* ISO 1101 Geometrical tolerance and where to use the norm
* Measuring tools
* Hand tools
* Sheet metal development
* Joining methods (bolts, screws, rivets, seams, soldering, brazing and welding)
* Cutting, bending, and rolling machines
* Drilling, and punching machines, drills and punches
* WIBA act (2007)
* Report writing

**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 learner: * 1. Observed safety rules and procedures in sheet metal work as per the workplace procedures.
	2. Used sheet metal machine, tools and equipment as per manufacturers manual
	3. Prepared operation Plan as per the working drawings
	4. Sketched Pattern development layout as per the work specification
	5. Marked dimensions on work piece as per the specifications
	6. Selected machine, tools and equipment as per

 operation plan * 1. Produced sheet metal work pieces as per operation plan
	2. Joined sheet metal parts as per the specifications
	3. Inspected finished work to specification
	4. Cleaned machines, tools and equipment as per the work place procedures
	5. Cleaned work environment in accordance with work place procedures
	6. Prepared reports as per workplace procedures.
 |
| 1. Resource Implications
 | 2.1 Cutting Machine 2.2 Rolling Machine 2.3 Bending machine 2.4 Punching machine 2.5 Drilling machine 2.6 Hand shearing machine 2.7 Hand tool and measuring instruments 2.8 Inspection tools 2.9 Gas welding set 2.10 Sheet metal materials 2.11 Resource materials, manuals for cutting tools and machine tools 2.12 Material safety data sheets 2.13 Occupational and safety act Kenya 2007  |
| 1. Methods of Assessment
 | Competency may be assessed through:3.1. Observing the behavior of the learner 3.2. Inspecting of the written operation procedures 3.3. Inspecting the quality of the finished product with regards to drawing specification and tolerances. 3.4. Observing housekeeping by the learner 3.5. Observed the maintenance of tools and equipment  |
| 1. Context of

Assessment  | Competency may be assessed individually in the actual workplace or through accredited institutions  |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.  |

# PERFORM GRINDING OPERATIONS

**UNIT CODE:** ENG/OS/ME/CR/02/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to perform grinding operations. Competencies includes: observing safety rules and regulations, identification of types of grinding machines and parts of grinding machines, demonstration of working principles of operations, identification of grinding operations, preparation of work piece, inspection of the finished work, and maintenance of the grinding machine and accessories.

**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 italicised terms are elaborated in the Range)*** |
| --- | --- |
| 1. Observe safety rules and regulations.
 | 1.1 Personal safety gearis worn as per work place procedure. 1.2 Safety measures for the operation of grinding machines are adhered to as per rules and regulations 1.3 Safe work environment is observed as per workplace rules and regulations 1.4 Workplace procedures are adhered to as per job requirements. |
| 1. Identify grinding machine tools
 | * 1. Grinding machineis identified as per job requirements.
	2. ***Grinding machine tools*** areselected as per the operation plan
	3. ***Grinding machine tools*** used as per manufacturer’s specification manual.
 |
| 3. Identify grinding wheels | * 1. Grinding wheels/stones are identified as per job requirements.
	2. Grinding wheel defects identified
	3. Grinding wheels’ calculation and geometry identified as per SOPs
	4. Wheel dressing identified as per the working area requirements
	5. Wheel balancing and wheel truing identified as per the manufacturers manual
 |
| 4. Plan work operation | * 1. Technical drawings and geometric symbols are read and interpreted as per ***drawing standards***.
	2. Operation Plan is prepared as per the working drawings.
 |
| 5. Set up the grinding machine | * 1. Grinding Machine tools are selected as per

 operation plan * 1. Attachmentsaremounted as per manufacturer’s manual and operation plan.
	2. Work piece is mounted as per workplace procedures.
 |
| 1. Perform grinding operations
 | * 1. Grinding operation is selected as per the operation plan.
	2. Work piece is machined according to work specifications
 |
| 1. Inspect finished work piece
 | 1. Finished work piece is cleaned as per workplace procedures.
2. Finished work piece is inspected as per job requirements
3. Finished work piece is tested for functionality as per the job requirements
 |
| 1. Maintain grinding machine
 | * 1. Grinding machine is cleaned.
	2. Grinding machine is serviced.
	3. Accessories are cleaned
 |
| 1. Perform Housekeeping
 | * 1. Workplace is cleaned before, during and after.
	2. Tools and equipment are cleaned and stored
	3. Grinding wheels/stones are stored
 |
| 1. Prepare reports
 | * 1. Any defects/deviations are reported according to workplace procedures.
	2. Any cost variations are reported as per workplace procedures.
	3. Accidents and incidents are reported according to workplace procedure
 |

**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.

| **Variable** | **Range** |
| --- | --- |
| Maintenance tools and equipment may include but not limited to: | * Spanners
* Wrenches
* Cyclic pliers
* Pullers
* Grinding machine
* Grinding machine accessories
 |
| Materials may include but not limited to: | * Iron steel
* Bearings
* Grease and oil.
 |
| Machine components may include but not limited to: | * Abrasive wheels
* Base/bed
* Headstock
* Wheel head
* Gears
* Shafts
* Pulleys
 |
| Grinding machine tools | * Surface grinding machine
* Cylindrical grinding machine
* Tool grinding machine
* Hand grinding machine
 |

**REQUIRED KNOWLEDGE AND UNDERSTANDING**

The individual needs to demonstrate knowledge and understanding of:

|  |
| --- |
| * Occupational Health and Safety Act of Kenya laws 2007 with focus on personal safety, machine safety and workplace
* National Environment Management Authority Act, Kenya 2004
* OSH act
* Equipment manuals
* Technical drawing complying to ISO, ANSI & BS standards  Mathematics & science
* Metallurgy and materials
* Inspection and testing
* WIBA act
* Report writing
* Functionality of machines
* Types of machines
* Components of grinding machine/equipment
* Types lubricants
* Tools and equipment used when grinding
* Safety measures and precautions during grinding operations
* Machinery start up procedure
* Machinery shutting down procedure
* Maintenance of work area
 |

**FOUNDATION SKILLS**

|  |
| --- |
| The individual needs to demonstrate the following additional skills: |
| * Basic communication skills
* Determining and selecting grinding machine based on the type of grinding operations
* Using appropriate lubricant requirement
* Operating different grinding machine tools
* Use of PPE
* Observing safety practices at workplace
* Assessment of machine performance
* Basic information record keeping
* Basic data analysis and presentation
* Basic digital Literacy
 | * Decision making;
* Report writing;
* Creativity
* Self-driven
 |

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Observed safety rules and regulations as per workplace procedures
	2. Identified grinding machine tools and accessories as per job requirements
	3. Identified grinding wheels as per job requirements
	4. Prepared Operation Plan as per job requirements.
	5. Mounted Work piece as per workplace procedures.
	6. Performed grinding operations as per operation plan
	7. Inspected finished work piece as per job requirements
	8. Serviced grinding machine as per manufacturer’s manual
	9. Performed Housekeeping as per workplace procedures
	10. Prepared reports as per workplace procedures
 |
| 1. Resource Implications
 | Resources the same as that of workplace are advised to be appliedIncluded: surface &portable grinder, accessories for clamping, dressing attachment, grinding wheels, measuring instruments inspection tools, Stationeries, computers, lubricants, PPE, machines. |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Oral questioning
	2. Practical demonstration
	3. Observation
	4. Written tests
 |
| 1. Context of Assessment
 | Competency may be assessed individually in the actual workplace or through simulated work environment |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |