



**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**MECHANICAL PRODUCTION(LATHE AND FABRICATION ) ARTISAN**

**LEVEL 4**



**TVET CDACC**  
**P.O BOX 15745-00100**  
**NAIROBI**

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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 form Mechanical Production (Lathe 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 Mechanical Production (Lathe and fabrication) Artisan. These standards will be the bases for development of a competency-based curriculum Mechanical Production (Lathe 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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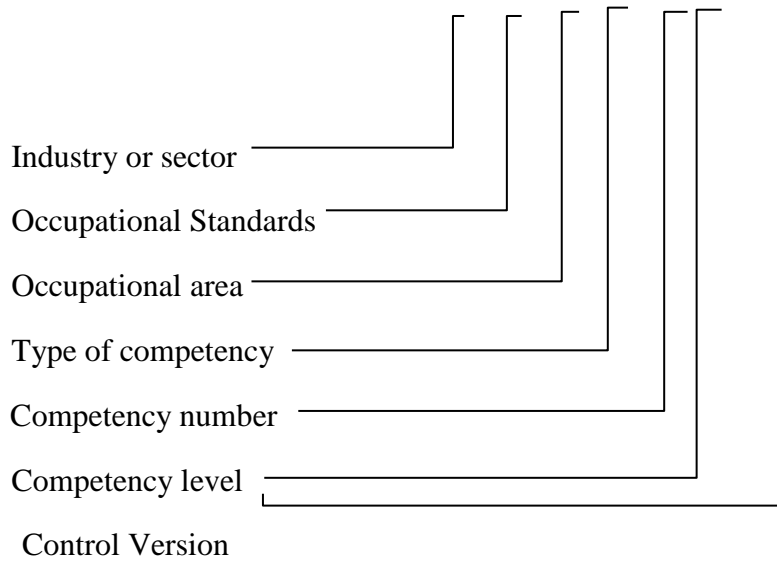
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## ACRONYMS

CDACC	Curriculum Development, Assessment and Certification Council
EBK	Engineers Board of Kenya
EBP	Engineering best practice
EHS	Environment, Health and Safety
IEE	Institute of Electrical Engineers
IBMS	Integrated Building Management System
KEBS	Kenya Bureau of Standards
NCA	National Construction Authority
OSHA	Occupational Safety and Health Act
PPE	Personal Protective Equipment
TVET	Technical and Vocational Education and Training
SOP	Standard operating procedure
WIBA	Work injury benefits Act
ENG	Engineering
OS	Occupational Standards
CU	Curriculum
ME	Mechanical Engineering
BC	Basic Competencies
CC	Common Competencies
CR	Core Competencies
A	Control Version

## KEY TO UNIT CODE

ENG/OS/MLF/BC/01/4/B



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## OVERVIEW

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

A Mechanical production (Lathe and fabrication) artisan is a person who will carry out Lathe 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 and produce components on a lathe machine according to the national and international standards.

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

### BASIC COMPETENCIES

Unit of Competency Code	Unit of Competency Title
ENG/OS/MLF/BC/01/4/B	Demonstrate communication skills
ENG/OS/MLF/BC/02/4/B	Demonstrate numeracy skills
ENG/OS/MLF/BC/03/4/B	Demonstrate digital literacy
ENG/OS/MLF/BC/04/4/B	Demonstrate employability skills
ENG/OS/MLF/BC/05/4/B	Demonstrate employability skills
ENG/OS/MLF/BC/06/4/B	Demonstrate environmental literacy
ENG/OS/MLF/BC/07/4/B	Demonstrate occupational safety and health practices

### COMMON COMPETENCIES

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

### CORE COMPETENCIES

Unit of Competency Code	Unit of Competency Title
ENG/OS/MLF/CR/01/4/B	Fabricate sheet metal parts
ENG/OS/MLF/CR/02/4/B	Produce components on the lathe

## **BASIC UNITS OF COMPETENCY**

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## DEMONSTRATE COMMUNICATION SKILLS

**UNIT CODE:** ENG/OS/MLF/BC/01/4/B

### UNIT DESCRIPTION

This unit covers the competencies required to use specialized communication skills to meet specific needs of internal and external clients, conduct interviews, facilitate discussion with groups and contribute to the development of communication strategies.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements. <b><i>Bold and italicized terms are elaborated in the Range</i></b>
1. Meet communication needs of clients and colleagues	1 .1 Specific communication needs of clients and colleagues are identified and met 1 .2 Different approaches are used to meet communication needs of clients and colleagues 1 .3 Conflict is addressed promptly and in a timely way and in a manner, which does not compromise the standing of the organization
2. Contribute to the development of communication strategies	2.1 Strategies for internal and external dissemination of information are developed, promoted, implemented and reviewed as required 2.2 Channels of communication are established and reviewed regularly 2.3 Coaching ineffective communication is provided 2.4 Work related network and relationship are maintained as necessary 2.5 Negotiation and conflict resolution strategies are used where required 2.6 Communication with clients and colleagues is appropriate to individual needs and organizational objectives
3. Conduct interviews	3.1 A range of appropriate communication strategies are employed in <b><i>interview situations</i></b> 3.2 Records of interviews are made and maintained in accordance with organizational procedures 3.3 Effective questioning, listening and nonverbal communication techniques are used to ensure that required message is communicated
4. Facilitate group discussions	4.1 Mechanisms which enhance effective group interaction is defined and implemented

	<p>4.2 Strategies which encourage all group members to participate are used routinely</p> <p>4.3 Objectives and agenda for meetings and discussions are routinely set and followed</p> <p>4.4 Relevant information is provided to group to facilitate outcomes</p> <p>4.5 Evaluation of group communication strategies is undertaken to promote participation of all parties</p> <p>4.6 Specific communication needs of individuals are identified and addressed</p>
5. Represent the organization	<p>5.1 When participating in internal or external forums, presentation is relevant, appropriately researched and presented in a manner to promote the organization</p> <p>5.2 Presentation is clear and sequential and delivered within a predetermined time</p> <p>5.3 Utilize appropriate media to enhance presentation</p> <p>5.4 Differences in views are respected</p> <p>5.5 Written communication is consistent with organizational standards</p> <p>5.6 Inquiries are responded in a manner consistent with organizational standard</p>

### 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
Communication strategies includes but not limited:	<ul style="list-style-type: none"> <li>● Language switch</li> <li>● Comprehension check</li> <li>● Repetition</li> <li>● Asking confirmation</li> <li>● Paraphrase</li> <li>● Clarification request</li> <li>● Translation</li> <li>● Restructuring</li> <li>● Approximation</li> <li>● Generalization</li> </ul>
Effective group interaction includes but not limited to:	<ul style="list-style-type: none"> <li>● Identifying and evaluating what is occurring within an interaction in a non-judgmental way</li> <li>● Using active listening</li> <li>● Making decision about appropriate words, behaviour</li> </ul>

	<ul style="list-style-type: none"> <li>● Putting together response which is culturally appropriate</li> <li>● Expressing an individual perspective</li> <li>● Expressing own philosophy, ideology and background and exploring impact with relevance to communication</li> <li>● Openness and flexibility in communication</li> </ul>
Situations includes but not limited to:	<ul style="list-style-type: none"> <li>● Establishing rapport</li> <li>● Eliciting facts and information</li> <li>● Facilitating resolution of issues</li> <li>● Developing action plans</li> <li>● Diffusing potentially difficult situations</li> </ul>

## 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:

- Effective communication process
- Active listening
- Giving/receiving feedback
- Interpretation of information
- Role boundaries setting
- Negotiation
- Establishing empathy
- Openness and flexibility in communication
- Communication skills required to fulfill job roles as specified by the organization

### Required Knowledge

The individual needs to demonstrate knowledge of:

- Communication process
- Dynamics of groups and different styles of group leadership
- Communication skills relevant to client groups
- Flexibility in communication
- Communication skills relevant to client groups
- Key elements of communications strategy.

## 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:
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	<p>1.1 Developed communication strategies to meet the organization requirements and applied in the workplace</p> <p>1.2 Established and maintained communication pathways for effective communication in the workplace</p> <p>1.3 Used communication strategies involving exchanges of complex oral information</p>
2 Resource Implications	<p>The following resources should be provided:</p> <p>2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place</p> <p>2.2 Materials relevant to the proposed activity or tasks</p>
3 Methods of Assessment	<p>Competency in this unit may be assessed through:</p> <p>3.1 Direct Observation</p> <p>3.2 Demonstration with Oral Questioning</p> <p>3.3 Written Examination</p>
4 Context of Assessment	<p>Competency may be assessed individually in the actual workplace or through accredited institution</p>
5 Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

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## DEMONSTRATE NUMERACY SKILLS

UNIT CODE: ENG/OS/MLF/BC/02/4/B

### 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

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements. <i><b>Bold and italicized terms are elaborated in the Range.</b></i>
1. Identify and use whole numbers and simple fractions, decimals and percentages for work	1.1 Simple fractions, decimals and percentages identified and interpreted 1.2 understanding of place value by organising numbers from smallest to largest demonstrated 1.3 Required numerical information located and decision made on appropriate method to solve a problem 1.4 Limited range of calculations performed using the 4 operations 1.5 Links between operations described 1.6 Estimations made to check reasonableness of results of problem-solving process 1.7 Numerical information recorded, and the result of the task communicated using informal and some formal language and symbolism

<p>2. Identify, measure and estimate familiar quantities for work</p>	<p>2.1 Measurement information in workplace tasks and texts identified and interpreted</p> <p>2.2 Familiar units of measurement needed for tasks is identified</p> <p>2.3 Familiar and simple amounts estimated</p> <p>2.4 Appropriate measuring equipment selected</p> <p>2.5 Simple measuring equipment graduated in familiar units to measure relevant quantities is used</p> <p>2.6 Calculation done using familiar units of measurement</p> <p>2.7 measurements and results checked against estimates</p> <p>2.8 Results are recorded or reported</p> <p>2.9 Results relevant to the workplace task are communicated using informal and some formal mathematical and general language</p>
<p>3. Read and use familiar maps, plans and diagrams for work</p>	<p>3.1 Items and places are in familiar maps, plans and diagrams</p> <p>3.2 Common symbols and keys recognised in familiar maps, plans and diagrams</p> <p>3.3 Understanding of direction and location demonstrated by describing the location of objects, or route to familiar places</p> <p>3.4 Instructions to locate familiar objects or places are given and followed</p> <p>3.5 Informal and some formal oral mathematical language and symbols are used</p>
<p>4. Identify and describe common 2D and some 3D shapes for work</p>	<p>4.1 Common 2D shapes and some common 3D shapes in familiar situations are identified and named</p> <p>4.2 Common 2D shapes and designs are compared and classified</p> <p>4.3 Informal and some formal language used to describe common two-dimensional shapes and some common three-dimensional shapes</p> <p>4.4 Simple items used to draw or construct common 2D shapes</p> <p>4.5 Common 3D shapes matched to their 2D sketches or nets</p>



<p>5. Construct simple tables and graphs for work using familiar data</p>	<p>5.1 Common types of graphs are identified and named  5.2 Familiar data to be collected is determined  5.3 A method to collect data is selected  5.4 A small amount of simple familiar data is collected  5.5 One or two variables determined from the data collected  5.6 Data ordered and collated  5.7 A table constructed, and data enter  5.8 Graphs are constructed using data from table  5.9 Results are promptly checked  5.10 Graph information related to work is reported or discussed using informal and some formal mathematical and general language</p>
<p>6. Identify and interpret information in familiar tables, graphs and charts for work</p>	<p>6.1 Simple tables are identified in familiar texts and contexts  6.2 Title, headings, rows and columns located in familiar tables  6.3 Information and data in simple tables identified and interpreted  6.4 Information is related to relevant workplace tasks  6.5 Familiar graphs and charts are identified in familiar texts and contexts  6.6 Title, labels, axes, scale and key from familiar graphs and charts are located  6.7 Information and data in familiar graphs and charts is identified and interpreted  6.8 Information related to relevant workplace tasks</p>

## 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.

<b>Variable</b>	<b>Range</b>
<p>1. Simple measuring equipment</p>	<p>May include but not limited to:</p> <p>1.1 Rulers  1.2 Watches/clocks  1.3 Scales  1.4 Thermometers</p>

	1.5 AVO meter
2. Common 2D shapes and common 3D shapes	May include but not limited to: 2.1 Round 2.2 Square 2.3 Rectangular 2.4 Triangle 2.5 Sphere 2.6 Cylinder 2.7 Cube 2.8 Polygons 2.9 Cuboids
3. Diagrammatical representation	May include but not limited to: 3.1 Charts 3.2 Maps 3.3 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:  1.1 Simple fractions, decimals and percentages are correctly identified and interpreted 1.2 Performed a limited range of calculations using the 4 operations 1.3 Performed calculations using familiar units of measurement 1.4 Recognised common symbols and keys in familiar maps, plans and diagrams 1.5 Constructed simple tables and graphs using familiar data 1.6 Identified and interpret information in familiar tables, graphs and charts
2. Resource Implications	2.1 Calculator 2.2 Basic measuring instruments
3. Methods of Assessment	Competency may be assessed through:  3.1 Written Test 3.2 Interview/Oral Questioning 3.3 Demonstration
4. Context of Assessment	Competency may be assessed in an off the job setting
5. 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/MLF/BC/03/4/B

This unit covers the competencies required to effectively use digital devices such as smartphones, tablets, laptops and desktop PCs. It entails identifying and using digital devices such as smartphones, tablets, laptops and desktop computers for purposes of communication, work performance and management at the work place.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b> These describe the key outcomes which make up workplace function	<b>PERFORMANCE CRITERIA</b> These are assessable statements which specify the required level of performance for each of the elements. <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Identify computer software and hardware	1.1 Concepts of ICT are determined in accordance with computer equipment 1.2 Classifications of computers are determined in accordance with manufacturers specification 1.3 <b>Computer software</b> is identified according to manufacturer's specification 1.4 <b>Computer hardware</b> is identified according to manufacturer's specification 1.5 Functions and commands of operating system are determined in accordance with manufacturer's specification
2. Apply security measures to data, hardware, software in automated environment	2.1 <b>Data security and privacy are classified</b> in accordance with the prevailing technology 2.2 <b>Security threats</b> are identified, <b>and control measures</b> are applied in accordance with laws governing protection of ICT 2.3 Computer threats and crimes are detected. 2.4 Protection against computer crimes is undertaken in accordance with laws governing protection of ICT
3. Apply computer software in solving basic tasks	3.1 <b>Word processing concepts</b> are applied in resolving workplace tasks, report writing and documentation 3.2 <b>Word processing utilities</b> are applied in accordance with workplace procedures 3.3 Worksheet layout is prepared in accordance with work procedures 3.4 Worksheet is built and data manipulated in the worksheet in accordance with workplace procedures 3.5 Continuous data manipulated on worksheet is undertaken in accordance with work requirements

	<p>3.6 Database design and manipulation is undertaken in accordance with office procedures</p> <p>3.7 Data sorting, indexing, storage, retrieval and security is provided in accordance with workplace procedures</p>
4. Apply internet and email in communication at workplace	<p>4.1 Electronic mail addresses are opened and applied in workplace communication in accordance with office policy</p> <p>4.2 Office internet functions are defined and executed in accordance with office procedures</p> <p>4.3 <b>Network configuration</b> is determined in accordance with office operations procedures</p> <p>4.4 Official World Wide Web is installed and managed according to workplace procedures</p>
5. Apply desktop publishing in official assignments	<p>5.1 Desktop publishing functions and tools are identified in accordance with manufactures specifications</p> <p>5.2 Desktop publishing tools are developed in accordance with work requirements</p> <p>5.3 Desktop publishing tools are applied in accordance with workplace requirements</p> <p>5.4 Typeset work is enhanced in accordance with workplace standards</p>
6. Prepare presentation packages	<p>6.1 Types of presentation packages are identified in accordance with office requirements</p> <p>6.2 Slides are created and formulated in accordance with workplace procedures</p> <p>6.3 Slides are edited and run in accordance with work procedures</p> <p>6.4 Slides and hand-outs are printed according to work requirements</p>

### 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
Computer software includes but not limited to:	A collection of instructions or computer tools that enable the user to interact with a <i>computer</i> , its hardware, or perform tasks.
Computer hardware includes but not limited to:	Collection of physical parts of a computer system such as; <ul style="list-style-type: none"> <li>• Computer case, monitor, keyboard, and mouse</li> </ul>

	<ul style="list-style-type: none"> <li>● All the parts inside the computer case, such as the hard disk drive, motherboard and video card</li> </ul>
Data security and privacy include but not limited to:	<ul style="list-style-type: none"> <li>● Confidentiality of data</li> <li>● Cloud computing</li> <li>● Integrity -but-curious data surfing</li> </ul>
Security and control measures include but not limited to:	<ul style="list-style-type: none"> <li>● Counter measures against cyber terrorism</li> <li>● Risk reduction</li> <li>● Cyber threat issues</li> <li>● Risk management</li> <li>● Pass wording</li> </ul>
Security threats include but not limited to:	<ul style="list-style-type: none"> <li>● Cyber terrorism</li> <li>● Hacking</li> </ul>
Word processing concepts include but not limited to:	Using a special program to create, edit and print documents
Network configuration 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:

- Software concept
- Functions of computer software and hardware
- Data security and privacy
- Computer security threats and control measures
- Technology underlying cyber-attacks and networks
- Cyber terrorism
- 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 sheets;
  - ✓ Meaning, formulae, function and charts, uses and layout
  - ✓ Data formulation, manipulation and application to cells
- Database;
  - Database design, data manipulation, sorting, indexing, storage retrieval and security
- Desktop publishing;
  - Designing and developing desktop publishing tools
  - Manipulation of desktop publishing tools
  - Enhancement of typeset work and printing documents
- Presentation Packages;
  - ✓ Types of presentation Packages
  - ✓ Creating, formulating, running, editing, printing and presenting slides and handouts
- Networking and Internet;
  - ✓ Computer networking and internet.
  - ✓ Electronic mail and world wide web
- Emerging trends and issues in ICT;
  - ✓ Identify and integrate 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: <ul style="list-style-type: none"> <li>1.1 Identified and controlled security threats</li> <li>1.2 Detected and protected computer crimes</li> <li>1.3 Applied word processing in office tasks</li> <li>1.4 Designed, prepared work sheet and applied data to the cells in accordance to workplace procedures</li> <li>1.5 Opened electronic mail for office communication as per workplace procedure</li> <li>1.6 Installed internet and World Wide Web for office tasks in accordance with office procedures</li> <li>1.7 Integrated emerging issues in computer ICT applications</li> </ul>
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	1.8 Applied laws governing protection of ICT
2. Resource Implications	2.1 Tablets 2.2 Laptops 2.3 Desktop computers 2.4 Calculators 2.5 Internet 2.6 Smart phones 2.7 Operation Manuals
3. Methods of Assessment	Competency may be assessed through: 3.1 Written Test 3.2 Demonstration 3.3 Practical assignment 3.4 Interview/Oral Questioning
4. Context of Assessment	Competency may be assessed in an off and on the job setting
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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## DEMONSTRATE ENTREPRENEURIAL SKILLS

UNIT CODE : ENG/OS/MLF/BC/04/4/B

### UNIT DESCRIPTION

This unit covers the outcomes required to build and develop the enterprise to be more competitive within a changing business environment, specifically responding to consumer demands while maintaining product quality and accessibility, building a customer base and employee motivation.

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements. <b><i>Bold and italicized terms are elaborated in the Range</i></b>
1. Develop business Innovative strategies	1.1 Business innovation strategies are determined in accordance with the organization strategies 1.2 Business innovative strategies are implemented for the purpose of business growth 1.3 Track record and normative capability profile of enterprise and similar businesses are reviewed and considered in setting <b><i>strategic directions</i></b> . 1.4 Strengths, weaknesses, opportunities and threats are considered when developing new ideas, approaches, goals and directions 1.5 Decisions about enterprise strategies/directions are made after careful consideration of all relevant information 1.6 <b><i>Business/corporate plan</i></b> is developed that sets out tactics, resource implications, timeframes, production and sales target
2. Develop new products/ markets	2.1 Alternative product/service offerings are canvassed and studied for feasibility 2.2 Potential and new sources/sellers of supplies and raw materials are identified and canvassed. 2.3 Target markets and buyers are identified and surveyed as to their preferences and brand loyalties.
3. Expand customers and product lines	3.1 Enterprise is built up and sustained through responsiveness to market demands and the regulatory environment. 3.2 Competitive advantage of existing products and services is maintained / enhanced through responsive advocacies and strategies.

	3.3 Constant listening to stakeholder/client feedback is ensured to maintain loyal client base.
4. Motivate staff/workers	4.1 Regular dialogue is established and maintained in all levels and relevant sections of the enterprise 4.2 Flow of communications in both directions is encouraged 4.3 Helpful mechanisms and benefits are implemented 4.4 Issues/problems are proactively resolved through win-win solutions wherever practicable
5. Expand employed capital base	5.1 Capital employed in business is continuously reviewed as per the strategic plan 5.2 Business share holdings are reviewed in accordance with the type of business 5.3 Capital employed is expanded according to organization procedures 5.4 Types of shares are determined according to strategic plan 5.5 Shares diversification process is undertaken as per office procedures 5.6 Role of shareholders is determined and implemented in accordance organization procedures
6. Undertake county/regional business expansion	6.1 Regions for expansion are continuously reviewed in accordance with strategic plan and company's expansion plan 6.2 County business regulations are reviewed and adhered to in accordance with set procedures 6.3 Regional laws and regulations are adhered to in accordance with set procedures 6.4 County/regional business expansion is undertaken in accordance with organization's growth/expansion plan

## 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
Strategic directions include but not limited to:	<ul style="list-style-type: none"> <li>● Business continuity and succession</li> <li>● Resource access security</li> <li>● Core competencies development</li> <li>● New developments e.g. technological change, new products</li> </ul>

Business/Corporate plan include but not limited to:	<ul style="list-style-type: none"> <li>● Action steps and responsibilities of departments and individual workers</li> <li>● Resource requirements and budget</li> <li>● Tactics and strategies to achieve objectives</li> </ul>
Helpful mechanisms include but not limited to:	<ul style="list-style-type: none"> <li>● Wage and non-wage benefits</li> <li>● Employee awards and recognition systems</li> <li>● Employee rights and welfare policies</li> <li>● Full-disclosure/transparency policies</li> </ul>

## 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:

- Assessing a range of alternative products and strategies
- Critically analyzing information, summarizing and making sense of previous and current market trends
- Identifying changing consumer preferences and demographics
- Thinking “outside the box”
- Ensuring quality consistency
- Reducing lead time to product/service delivery
- Managing operations/ production
- Using formal problem-solving procedures, e. g., root-cause analysis, six sigma’s
- Communication skills
- Applying motivational principles, e. g., positive stroking, behavior modification
- Assessing range of alternatives rather than choosing the easiest option
- Achieving ownership and credibility for the enterprise vision
- Critically analyzing information, summarizing and making sense of previous and current market trends
- Developing solutions and practical strategies which are “outside the box”

### Required Knowledge

The individual needs to demonstrate knowledge of:

- Features and benefits of common operational practices, e. g., continuous improvement (kaizen), waste elimination,
- Conflict resolution
- Health, safety and environment (HSE) principles and requirements
- Public-relations strategies
- Basic cost-benefit analysis
- Basic financial management

- Business strategic planning
- Impact of change on individuals, groups and industries
- Employee assistance
- Government and regulatory processes
- Local and international market trends
- Product promotion strategies
- Mechanisms in the enterprise
- Market and feasibility studies
- Local and global supply chains Business models and strategies
- Government and regulatory processes
- Local and international business environment
- Concepts of change management
- Relevant developments in other industries
- Capital employed
- Regional/ County business expansion
- Innovation in business

### 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: <ul style="list-style-type: none"> <li>1.1 Demonstrated ability to maintain a profitable and stable enterprise as shown by stakeholder feedback, employee testimonies and company financial statements</li> <li>1.2 Demonstrated ability to conceptualize and plan a micro/small enterprise</li> <li>1.3 Demonstrated ability to manage/operate a micro/small-scale business</li> <li>1.4 Demonstrated basic marketing skills</li> </ul>
2. Resource Implications	The following resources should be provided: <ul style="list-style-type: none"> <li>2.1 Interview guide for entrepreneurs</li> <li>2.2 Enterprise workers and third parties</li> <li>2.3 Materials and location relevant to the proposed activity and tasks</li> </ul>
3. Methods of Assessment	<ul style="list-style-type: none"> <li>3.1 Case problems</li> <li>3.2 Interview</li> <li>3.3 Portfolio</li> <li>3.4 Third part reports</li> </ul>
4. Context of Assessment	<ul style="list-style-type: none"> <li>2.1 Competency may be assessed in workplace or in a simulated workplace setting</li> <li>2.2 Assessment shall be observed while tasks are being undertaken whether individually or in-group</li> </ul>

5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.
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## DEMONSTRATE EMPLOYABILITY SKILLS

UNIT CODE: ENG/OS/MLF/BC/05/4/B

### UNIT DESCRIPTION

This unit covers competencies required to demonstrate employability skills. It involves competencies for exuding self-awareness and dealing with everyday life challenges; demonstrating critical safe work habits and leading a workplace team; planning and organizing work activities; applying learning, creativity and innovativeness in workplace functions; pursuing professional growth and managing time effectively in the workplace.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b> These describe the key outcomes which make up workplace function.	<b>PERFORMANCE CRITERIA</b> These are assessable statements which specify the required level of performance for each of the elements. <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Develop self-awareness and understanding of every day demands and challenges in the workplace	1.1 Personal vision, mission and goals are formulated based on potential and in relation to organization objectives 1.2 Emotions are managed as per workplace requirement 1.3 Thoughts, feelings and beliefs are expressed in direct, honest and appropriate ways. 1.4 Feelings are shared with others according to personal issues for healthy relations. 1.5 Individual performance is evaluated and monitored according to the agreed targets. 1.6 Assertiveness is developed and maintained based on the requirements of the job. 1.7 Own ideas and visions that generates excitement, enthusiasm and commitment are articulated. 1.8 Accountability and responsibility for own actions are demonstrated. 1.9 Self-esteem and a positive self-image are developed and maintained.
2. Demonstrate critical safe work habits for employees in the workplace	2.1 Stress is managed at the workplace in accordance with workplace procedures. 2.2 Punctuality and time consciousness is demonstrated in line workplace policy. 2.3 Personal objectives are integrated with organization goals in accordance with organization's strategic Plan. 2.4 Resources are effectively utilized in accordance with workplace policy.

	<p>2.5 Work priorities are set and met in according to workplace procedures.</p> <p>2.6 Leisure time is recognized and used productively in line with organization policy.</p> <p>2.7 Abstinence from drug and substance abuse is demonstrated as per workplace policy.</p> <p>2.8 Awareness of HIV and AIDS is demonstrated in line with workplace requirements.</p> <p>2.9 Safety consciousness is demonstrated in the workplace based on organization safety policy.</p> <p>2.10 Emerging issues are dealt with in accordance with organization policy.</p>
<p>3. Lead a workplace team</p>	<p>3.1 Role and objectives of the team are determined in accordance workplace policy.</p> <p>3.2 Team parameters and relationships are identified according to set rules and regulations.</p> <p>3.3 Individual responsibilities are identified in accordance with work procedures.</p> <p>3.4 Effective and appropriate forms of communication in a team are established according to office policy.</p> <p>3.5 Business communication is carried out as per workplace place policy and requirements of the job.</p> <p>3.6 Team activities are complemented in accordance with office procedures.</p> <p>3.7 Team building activities are planned for in line with organization policy.</p> <p>3.8 Conflicts are resolved between team members in line with organization rules and regulations.</p> <p>3.9 <b>Gender mainstreaming</b> is undertaken in accordance with set regulations.</p> <p>3.10 Human rights are adhered to in accordance with existing protocol.</p> <p>3.11 Healthy relationships are developed and maintained for harmonious co-existence in line with workplace</p>
<p>4 Plan and organize work</p>	<p>4.1 Work schedules are developed for accomplishing given tasks within the set time lines and based on workplace policy.</p> <p>4.2 Time is managed achieve workplace set goals and objectives.</p> <p>4.3 Clear project goals and deliverables are established according to company set policies and regulations.</p> <p>4.4 Resources are mobilized, allocated and utilized to meet project goals and deliverables.</p>

	<p>4.5 Work activities are monitored and evaluated in line with organization procedures.</p> <p>4.6 Situations that require decision making are identified within the work place and decision made in accordance with workplace policy.</p> <p>4.7 Steps required in making effective decisions are applied within the workplace.</p> <p>4.8 Problems arising in the course of working are identified and solved or reported according the workplace policies and procedures.</p> <p>4.9 Values required in problem solving process are demonstrated at the work place.</p> <p>4.10 Situations within the workplace that require negotiation identified and negotiations done to create win-win situations.</p> <p>4.11 Negotiation techniques are developed and applied at workplace to meet clientele’s satisfaction and organizations’ objectives.</p>
<p>5. Maintain professional growth and development in the workplace</p>	<p>5.1 Personal training needs are assessed and identified in line with the requirements of the job.</p> <p>5.2 <b>Training and career opportunities</b> are identified and availed based on job requirements.</p> <p>5.3 Resources for training are mobilized and allocated based organizations skills needs.</p> <p>5.4 Licenses and certifications relevant to job and career are obtained and renewed.</p> <p>5.5 Personal growth is pursued towards improving the qualifications set for the profession.</p> <p>5.6 Work priorities and commitments are managed based on requirement of the job and workplace policy.</p> <p>5.7 <b>Recognitions</b> are sought as proof of career advancement in line with professional requirements.</p>
<p>6. Demonstrate learning, creativity and innovativeness in the workplace</p>	<p>6.1 Time and effort is invested in learning new skills-based job requirements.</p> <p>6.2 Willingness to learn in different context is demonstrated based on available learning opportunities arising in the workplace.</p> <p>6.3 Learning opportunities are sought and allocated based on job requirement and in line with organization policy.</p> <p>6.4 Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job.</p>



	<p>6.5 Application of a range of basic IT skills is demonstrated based on requirements of the job.</p> <p>6.6 Awareness of Occupational Health and Safety procedures are demonstrated in use of technology in the workplace.</p> <p>6.7 Initiative is taken to create more effective and efficient processes and procedures in line with workplace policy.</p> <p>6.7 New systems are developed and maintained in accordance with the requirements of the job.</p> <p>6.8 Opportunities that are not obvious are identified and exploited in line with organization objectives.</p> <p>6.9 Opportunities for performance improvement are identified proactively in area of work.</p> <p>6.10 Awareness of personal role in workplace innovation is demonstrated.</p>
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## 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
Drug and substance abuse include but not limited to:	<p>Commonly abused</p> <ul style="list-style-type: none"> <li>● Alcohol</li> <li>● Tobacco</li> <li>● Miraa</li> <li>● Over-the-counter drugs</li> <li>● Cocaine</li> <li>● Bhang</li> <li>● Glue</li> </ul>
Feedback includes but not limited to:	<ul style="list-style-type: none"> <li>● Verbal</li> <li>● Written</li> <li>● Informal</li> <li>● Formal</li> </ul>
Clients includes but not limited to:	<ul style="list-style-type: none"> <li>● New clients</li> <li>● Existing clients</li> <li>● Internal clients</li> <li>● External clients</li> </ul>
Relationships includes but not limited to:	<ul style="list-style-type: none"> <li>● Man/Woman</li> <li>● Trainer/trainee</li> <li>● Employee/employer</li> <li>● Client/service provider</li> </ul>

	<ul style="list-style-type: none"> <li>● Husband/wife</li> <li>● Boy/girl</li> <li>● Parent/child</li> <li>● Sibling relationships</li> </ul>
Communication methods include but not limited to:	<ul style="list-style-type: none"> <li>● Written</li> <li>● Talk/presentation</li> <li>● Video</li> <li>● Audio</li> <li>● Graphical</li> <li>● Modeling</li> </ul>
Team includes but not limited to:	<ul style="list-style-type: none"> <li>● Small work group</li> <li>● Staff in a section/department</li> <li>● Inter-agency group</li> </ul>
Personal growth includes but not limited to:	<ul style="list-style-type: none"> <li>● Growth in the job</li> <li>● Career mobility</li> <li>● Gains and exposure the job gives</li> <li>● Net workings</li> <li>● Benefits that accrue to the individual as a result of noteworthy performance</li> </ul>
Personal objectives include but not limited to:	<ul style="list-style-type: none"> <li>● Long term</li> <li>● Short term</li> <li>● Broad</li> <li>● Specific</li> </ul>
Trainings and career opportunities includes but not limited to	<ul style="list-style-type: none"> <li>● Participation in training programs <ul style="list-style-type: none"> <li>✓ Technical</li> <li>✓ Supervisory</li> <li>✓ Managerial</li> <li>✓ Continuing Education</li> </ul> </li> <li>● Serving as Resource Persons in conferences and workshops</li> </ul>
Resource include but not limited to:	<ul style="list-style-type: none"> <li>● Human</li> <li>● Financial</li> <li>● Technology <ul style="list-style-type: none"> <li>✓ Hardware</li> <li>✓ Software</li> </ul> </li> </ul>
Innovation include but not limited to:	<ul style="list-style-type: none"> <li>● New ideas</li> <li>● Original ideas</li> <li>● Different ideas</li> <li>● Methods/procedures</li> <li>● Processes</li> <li>● New tools</li> </ul>

Emerging issues include but not limited to:	<ul style="list-style-type: none"> <li>● Terrorism</li> <li>● Social media</li> <li>● National cohesion</li> <li>● Open offices</li> </ul>
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## 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

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### 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	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Attained job targets within key result areas.</li> <li>1.2 Maintained intra- and inter-personal relationship in the course of managing oneself.</li> <li>1.3 Completed trainings and career progression opportunities in time.</li> <li>1.4 Was punctual and time conscious.</li> <li>1.5 Acquired and maintained licenses and/or certifications required for the job.</li> <li>1.6 Planned and organized resources to achieve organization goals and objectives.</li> <li>1.7 Monitored and evaluated work activities.</li> <li>1.8 Identified, analysed and solved problem arising in the course of working.</li> <li>1.9 Was conscious of health and safety while carrying out work functions.</li> </ul>
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	<p>1.10 Maintained a mentorship and coaching program for employees.</p> <p>1.11 Innovatively made work processes and procedures more efficient.</p> <p>1.12 Mainstreamed gender issues in the workplace.</p> <p>1.13 Build a strong team of workers in the workplace.</p> <p>1.14 Sought and allocated learning opportunities and resources in the workplace.</p> <p>1.15 Demonstrated awareness of HIV and AIDS.</p> <p>1.16 Abstained from drug and substance abuse.</p> <p>1.17 Demonstrated ability to cope with emerging issues.</p>
2. Resource Implications	<p>The following resources should be provided:</p> <p>2.1 Workplace or assessment location</p> <p>2.2 Case studies/scenarios</p>
3. Methods of Assessment	<p>Competency in this unit may be assessed through:</p> <p>3.1 Oral Interview</p> <p>3.2 Observation</p> <p>3.3 Third Party Reports</p> <p>3.4 Written tests</p>
4. Context of Assessment	<p>4.1 Competency may be assessed in workplace or in a simulated workplace setting</p> <p>4.2 Assessment shall be observed while tasks are being undertaken whether individually or in-group</p>
5. Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

## DEMONSTRATE ENVIRONMENTAL LITERACY

UNIT CODE: ENG/OS/MLF/BC/06/4/B

### 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, evaluate current practices in relation to resource usage, develop and adhere to environmental protection principles/strategies/guidelines.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b> These describe the key outcomes which make up workplace function.	<b>PERFORMANCE CRITERIA</b> These are assessable statements which specify the required level of performance for each of the elements. <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Control environmental hazard	1.1 <i><b>Storage methods</b></i> for environmentally <i><b>hazardous</b></i> materials are strictly followed according to environmental regulations and OSHS. 1.2 <i><b>Disposal methods</b></i> of hazardous wastes are followed always according to environmental regulations and OSHS. 1.3 <i><b>PPE</b></i> is used according to OSHS.
2. Control environmental Pollution	2.1 Environmental pollution <i><b>control measures</b></i> are compiled following standard protocol. 2.2 Procedures for solid waste management are observed according to Environmental Management and Coordination Act 1999 2.3 Methods for minimizing <i><b>noise pollution</b></i> complied following environmental regulations.
3. Demonstrate sustainable resource use	3.1 Methods for minimizing wastage are complied with. 3.2 Waste management procedures are employed following principles of 3Rs (Reduce, Reuse, Recycle) 3.3 Methods for economizing or reducing resource consumption are practiced.
4. Evaluate current practices in relation to resource usage	4.1 Information on resource efficiency <i><b>systems and procedures</b></i> are collected and provided to the work group where appropriate. 4.2 Current resource usage is measured and recorded by members of the work group. 4.3 Current purchasing strategies are analyzed and recorded according to industry procedures. 4.4 Current work processes to access information and data is analysed following enterprise protocol.

5. Identify environmental legislations/conventions for environmental concerns	5.1 Environmental <i>legislations/conventions</i> and local ordinances are identified according to the different <i>environmental aspects/impact</i> 5.2 <i>Industrial standard/environmental practices</i> are described according to the different environmental concerns
6. Implement specific environmental programs	6.1 Programs/Activities are identified according to organizations policies and guidelines. 6.2 Individual roles/responsibilities are determined and performed based on the activities identified. 6.3 Problems/constraints encountered are resolved in accordance with organizations’ policies and guidelines 6.4 Stakeholders are consulted based on company guidelines
7. Monitor activities on environmental protection/Programs	7.1 Activities are periodically monitored and evaluated according to the objectives of the environmental Program 7.2 Feedback from stakeholders are gathered and considered in proposing enhancements to the program based on consultations 7.3 Data gathered is analysed based on evaluation requirements 7.4 Recommendations are submitted based on the findings 7.5 Management support systems are set/established to sustain and enhance the program 7.6 Environmental incidents are monitored and reported to concerned/proper authorities

**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 include but are not limited to:	<ul style="list-style-type: none"> <li>● Mask</li> <li>● Gloves</li> <li>● Goggles</li> <li>● Safety hat</li> <li>● Overall</li> <li>● Hearing protector</li> <li>● Safety boots</li> </ul>

Environmental pollution control measures include but are not limited to:	<ul style="list-style-type: none"> <li>● Methods for minimizing or stopping spread and ingestion of airborne particles</li> <li>● Methods for minimizing or stopping spread and ingestion of gases and fumes</li> <li>● Methods for minimizing or stopping spread and ingestion of liquid wastes</li> </ul>
Waste management procedure include but are not limited to:	<ul style="list-style-type: none"> <li>● Sorting</li> <li>● Storing of items</li> <li>● Recycling of items</li> <li>● Disposal of items</li> </ul>
Resources may include but are not limited to:	<ul style="list-style-type: none"> <li>● Electric</li> <li>● Water</li> <li>● Fuel</li> <li>● Telecommunications</li> <li>● Supplies</li> <li>● Materials</li> </ul>
Workplace environmental hazards include but are not limited to:	<ul style="list-style-type: none"> <li>● Biological hazards</li> <li>● Chemical and dust hazards</li> <li>● Physical hazards</li> </ul>
Organizational systems and procedures include but are not limited to:	<ul style="list-style-type: none"> <li>● Supply chain, procurement and purchasing</li> <li>● Quality assurance</li> <li>● Making recommendations and seeking approvals</li> </ul>

## 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
- Analysing resource flow
- Determining efficiency of use/conversion of resources
- Determining causes of low efficiency of use
- Developing plans for increasing the efficiency of resource use
- Checking resource use plans
- Complying to regulations/licensing requirements
- Determining benefit/cost of plans
- Ranking proposals based on benefit/cost compared to limited resources
- Checking proposals meet regulatory requirements
- Monitoring implementation
- Adjusting plan and implementation
- checking new resource usage

### **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
- 3Rs principle
- 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
- Resource consuming processes
- Determination of quantity and nature of resource consumed
- Analysis of resource flow of different parts of the resource flow process
- Use/conversion of resources
- Causes of low efficiency of use
- Increasing the efficiency of resource use
- Inspection of resource use plans
- Regulations/licensing requirements
- Determine benefit/cost for alternative resource sources
- Benefit/costs for different alternatives
- Components of proposals
- Criteria on ranking proposals
- Regulatory requirements
- Proposals for improving resource efficiency
- Implementation of resource efficiency plans
- Procedures in monitor implementation
- Adjustments of implementation plan
- Inspection of new resource usage

### **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	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Controlled environmental hazard</li> <li>1.2 Controlled environmental pollution</li> <li>1.3 Demonstrated sustainable resource use</li> <li>1.4 Evaluated current practices in relation to resource usage</li> <li>1.5 Demonstrated knowledge of environmental legislations and local ordinances according to the different environmental issues /concerns.</li> <li>1.6 Described industrial standard environmental practices according to the different environmental issues/concerns.</li> <li>1.7 Resolved problems/ constraints encountered based on management standard procedures</li> </ul>
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	<p>1.8 Implemented and monitored environmental practices on a periodic basis as per company guidelines</p> <p>1.9 Recommended solutions for the improvement of the Program</p> <p>1.10 Monitored and reported to proper authorities any environmental incidents</p>
2. Resource Implications	<p>The following resources should be provided:</p> <p>2.1 Workplace with storage facilities</p> <p>2.2 Tools, materials and equipment relevant to the tasks (ex. Cleaning tools, cleaning materials, trash bags, etc.)</p> <p>2.3 PPE</p> <p>2.4 Manuals and references</p> <p>2.5 Legislation, policies, procedures, protocols and local ordinances relating to environmental protection</p> <p>2.6 Case studies/scenarios relating to environmental Protection</p>
3 Methods of Assessment	<p>Competency in this unit may be assessed through:</p> <p>3.1 Demonstration</p> <p>3.2 Oral questioning</p> <p>3.3 Written examination</p> <p>3.4 Interview/Third Party Reports</p> <p>3.5 Portfolio (citations/awards from GOs and NGOs, certificate of training – local and abroad)</p> <p>3.6 Simulations and role-plays</p>
4 Context of Assessment	<p>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.</p>
5 Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

## DEMONSTRATE OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** ENG/OS/MLF/BC/07/4/B

### UNIT DESCRIPTION

This unit specifies the competencies required to lead the implementation of workplace's safety and health program, procedures and policies/guidelines.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
<p>These describe the key outcomes which make up workplace function.</p>	<p>These are assessable statements which specify the required level of performance for each of the elements.</p> <p><b><i>Bold and italicized terms are elaborated in the Range</i></b></p>
<p>1. Identify workplace hazards and risk</p>	<p>1.1 <b><i>Hazards</i></b> in the workplace and/or its <b><i>indicators</i></b> of its presence, are identified</p> <p>1.2 <b><i>Evaluation and/or work environment</i></b> measurements of OSH hazards/risk existing in the workplace is conducted by Authorized personnel or agency</p> <p>1.3 <b><i>OSH issues and/or concerns</i></b> raised by workers are Gathered</p>
<p>2. Identify and implement appropriate control measures</p>	<p>2.1 Prevention <b><i>and control measures</i></b>, including use of <b><i>safety gears / PPE (personal protective equipment)</i></b> for specific hazards identified and implemented</p> <p>2.2 Appropriate <b><i>risk controls</i></b> based on result of OSH hazard evaluation is recommended.</p> <p>2.3 <b><i>Contingency measures</i></b>, including <b><i>emergency procedures</i></b> during workplace <b><i>incidents and emergencies</i></b> are recognized and established in accordance with organization procedures.</p>
<p>3. Implement OSH programs, procedures and policies/ guidelines</p>	<p>3.1 Information to work team about company OSH program, procedures and policies/guidelines are provided</p> <p>3.2 Implementation of OSH procedures and policies/guidelines are participated</p> <p>3.3 Team members are trained and advised on OSH standards and procedures</p> <p>3.4 Procedures for maintaining <b><i>OSH-related records</i></b> are implemented</p>

## 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
Hazards include but are not limited to:	<ul style="list-style-type: none"> <li>● Physical hazards – impact, illumination, pressure, noise, vibration, extreme temperature, radiation</li> <li>● Biological hazards- bacteria, viruses, plants, parasites, mites, molds, fungi, insects</li> <li>● Chemical hazards – dusts, fibers, mists, fumes, smoke,</li> <li>● gasses, vapors</li> <li>● Ergonomics Psychological factors – over exertion/ excessive force, awkward/static positions, fatigue, direct pressure</li> <li>● varying metabolic cycles</li> <li>● Physiological factors – monotony, personal relationship, work out cycle</li> <li>● Safety hazards (unsafe workplace condition) –</li> <li>● confined space, excavations, falling objects, gas leaks, electrical, poor storage of materials and waste, spillage, waste and debris</li> <li>● Unsafe workers’ act (Smoking in off-limited areas, Substance and alcohol abuse at work)</li> </ul>
Indicators include but are not limited to:	<ul style="list-style-type: none"> <li>● Increased of incidents of accidents, injuries</li> <li>● Increased occurrence of sickness or health complaints/ symptoms</li> <li>● Common complaints of workers related to OSH</li> <li>● High absenteeism for work-related reasons</li> </ul>
Evaluation and/or work environment measurements include but are not limited to:	<ul style="list-style-type: none"> <li>● Health Audit</li> <li>● Safety Audit</li> <li>● Work Safety and Health Evaluation</li> <li>● Work Environment Measurements of Physical and Chemical Hazards</li> </ul>
OSH issues and/or concerns include but are not limited to:	<ul style="list-style-type: none"> <li>● Workers’ experience/observance on presence of work hazards</li> <li>● Unsafe/unhealthy administrative arrangements (prolonged work hours, no break time, constant overtime, scheduling of tasks)</li> <li>● Reasons for compliance/non-compliance to use of PPEs or other OSH procedures/policies/guidelines</li> </ul>

<p>Prevention and control measures include but are not limited to:</p>	<ul style="list-style-type: none"> <li>● Eliminate the hazard (i.e., get rid of the dangerous machine)</li> <li>● Isolate the hazard (i.e. keep the machine in a closed room and operate it remotely; barricade an unsafe area off)</li> <li>● Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one)</li> <li>● 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)</li> <li>● Use engineering controls to reduce the risk (i.e. use safety guards to machine)</li> <li>● Use personal protective equipment</li> <li>● Safety, Health and Work Environment Evaluation</li> <li>● Periodic and/or special medical examinations of workers</li> </ul>
<p>Safety gears /PPE (Personal Protective Equipment's) include but are not limited to:</p>	<ul style="list-style-type: none"> <li>● Arm/Hand guard, gloves</li> <li>● Eye protection (goggles, shield)</li> <li>● Hearing protection (ear muffs, ear plugs)</li> <li>● Hair Net/cap/bonnet</li> <li>● Hard hat</li> <li>● Face protection (mask, shield)</li> <li>● Apron/Gown/coverall/jump suit</li> <li>● Anti-static suits</li> <li>● High-visibility reflective vest</li> </ul>
<p>Appropriate risk controls include but not limited to:</p>	<ul style="list-style-type: none"> <li>● Appropriate risk controls in order of impact are as follows: <ul style="list-style-type: none"> <li>○ Eliminate the hazard altogether (i.e., get rid of the dangerous machine)</li> <li>○ Isolate the hazard from anyone who could be harmed (i.e., keep the machine in a closed room and operate it remotely; barricade an unsafe area off)</li> <li>○ Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one)</li> <li>○ Use administrative controls to reduce the risk (i.e., train workers how to use equipment safely; train workers about the risks of harassment; issue signage)</li> <li>○ Use engineering controls to reduce the risk (i.e., attach guards to the machine to protect users)</li> <li>○ Use personal protective equipment (i.e., wear</li> </ul> </li> </ul>

	gloves and goggles when using the machine)
Contingency measures include but are not limited to:	<ul style="list-style-type: none"> <li>● Evacuation</li> <li>● Isolation</li> <li>● Decontamination</li> <li>● (Calling designed) emergency personnel</li> </ul>
Emergency procedures include but are not limited to:	<ul style="list-style-type: none"> <li>● Fire drill</li> <li>● Earthquake drill</li> <li>● Basic life support/CPR</li> <li>● First aid</li> <li>● Spillage control</li> <li>● Decontamination of chemical and toxic</li> <li>● Disaster preparedness/management</li> <li>● Se of fire-extinguisher</li> </ul>
Incidents and emergencies include but are not limited to:	<ul style="list-style-type: none"> <li>● Chemical spills</li> <li>● Equipment/vehicle accidents</li> <li>● Explosion</li> <li>● Fire</li> <li>● Gas leak</li> <li>● Injury to personnel</li> <li>● Structural collapse</li> <li>● Toxic and/or flammable vapour emission.</li> </ul>
OSH-related Records include but are not limited to:	<ul style="list-style-type: none"> <li>● Medical/Health records</li> <li>● Incident/accident reports</li> <li>● Sickness notifications/sick leave application</li> <li>● OSH-related trainings obtained</li> </ul>

## 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:

- Skills on preliminary identification of workplace hazards/risks
- Knowledge management
- Critical thinking skills
- Observation skills
- Coordinating skills
- Communication skills
- Interpersonal skills

- Troubleshooting skills
- Presentation skills
- Training skills

### Required Knowledge

The individual needs to demonstrate knowledge of:

- General OSH Principles
- Occupational hazards/risks recognition
- OSH organizations providing services on OSH evaluation and/or work environment measurements (WEM)
- National OSH regulations; company OSH policies and protocols
- Systematic gathering of OSH issues and concerns
- General OSH principles
- National OSH regulations
- Company OSH and recording protocols, procedures and policies/guidelines
- Training and/or counselling methodologies and strategies

### EVIDENCE GUIDE

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

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Identifies hazards/risks in the workplace and/or its indicators</li> <li>1.2 Requests for evaluation and/or work environment measurements of OSH hazards/risk in the workplace</li> <li>1.3 Gathers OSH issues and/or concerns raised by workers</li> <li>1.4 Identifies and implements prevention and control measures, including use of PPE (personal protective equipment) for specific hazards</li> <li>1.5 Recommends appropriate risk controls based on result of OSH hazard evaluation and OSH issues gathered</li> <li>1.6 Establish contingency measures, including emergency procedures in accordance with organization procedures</li> <li>1.7 Provides information to work team about company OSH program, procedures and policies/guidelines</li> <li>1.8 Participates in the implementation of OSH procedures and policies/guidelines</li> <li>1.9 Trains and advises team members on OSH standards and procedures</li> <li>1.10 Implements procedures for maintaining OSH-related records</li> </ul>
<p>2. Resource Implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> <li>2.1 Workplace or assessment location</li> <li>2.2 OSH personal records</li> </ul>



	2.3 PPE 2.4 Health records
3. Methods of Assessment	Competency may be assessed through: 3.1 Portfolio Assessment 3.2 Interview 3.3 Case Study/Situation 3.4 Observation/Demonstration and oral questioning

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## COMMON UNITS OF COMPETENCIES

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## INTERPRET BASIC TECHNICAL DRAWINGS

**UNIT CODE:** ENG/OS/MLF/CC/01/4/B

### 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 fabrication and machining of components on the lathe.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
<p>These describe the key outcomes which make up workplace function.</p>	<p>These are assessable statements which specify the required level of performance for each of the elements. <i>(Bold and italicised terms are elaborated in the Range)</i></p>
<p>1. Use drawing instruments and materials</p>	<p>1.1 <b>Personal Protective Equipment</b> is used according to occupational safety and health regulations                      1.2 <b>Drawing instruments</b> are identified and gathered according to task requirements                      1.3 <b>Drawing materials</b> are identified and gathered according to task requirements                      1.4 Drawing instruments are used as per the task specification                      1.5 Drawing instruments are maintained as per manufacturer's instructions                      1.6 Drawing materials are used as per workplace procedures                      1.7 Waste materials are disposed in accordance with workplace procedures and <b>environmental legislations</b></p>
<p>2. Interpret plane geometry drawings</p>	<p>2.1 Different lines used in drawing are identified according to standard drawing conventions                      2.2 Different <b>geometric forms</b> are constructed according to standard conventions                      2.3 Different angles are measured using appropriate measuring tools                      2.4 Angles are bisected according to standard conventions                      2.5 Freehand sketching of different geometric forms, tools, equipment, diagrams is conducted</p>

3. Interpret solid geometry drawings	3.1 Drawings of patterns are interpreted according to standard conventions 3.2 Patterns are developed in accordance with drawing specification
4. Interpret orthographic and pictorial drawings	4.1 Drawing symbols, abbreviations are interpreted according to standard drawing conventions 4.2 First and third angle orthographic drawings produced in accordance with the standard conventions 4.3 Orthographic elevations are dimensioned in accordance with standard conventions 4.4 Isometric drawings are produced in accordance with standard conventions
5. Interpret mechanical drawings	5.1 Mechanical symbols and abbreviations are interpreted according to BS 3939 5.2 Mechanical drawings are interpreted in accordance with BS 3939

### 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, closed leather shoes
Drawing instrument includes but not limited to:	Drawing boards, T and set squares, drawing sets, curves, protractor, ruler, computers with CAD packages
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 include but not limited to:	Circles, triangles, rectangles, parallelogram, polygons, pyramids, conic sections, prisms, loci
Standard conventions include but not limited to:	<ul style="list-style-type: none"> <li>● Anatomy of engineering drawing (title block, coordinate grid system, revision block, notes and legends)</li> <li>● Drawing scale (paper size and drawing symbols)</li> <li>● International drawing standards</li> </ul>
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
- Drawing equipment handling
- 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: 1.1 Used <b>Personal Protective Equipment</b> according to occupational safety and health regulations 1.2 Used drawing instruments as per the task specification 1.3 Used drawing materials as per workplace procedures 1.4 Identified different lines used in drawing according to standard drawing conventions 1.5 Conducted freehand sketching of different geometric forms, tools, equipment and diagrams
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	<p>1.6 Developed patterns in accordance with drawing specification</p> <p>1.7 Produced first and third angle orthographic drawings in accordance with the standard conventions</p> <p>1.8 Produced isometric drawings in accordance with standard conventions</p> <p>1.9 Produced mechanical drawings in accordance with BS 3939</p>
2. Resource Implications	<p>Resources the same as that of workplace are advised to be applied.</p> <p>2.1 Drawing room</p> <p>2.2 Drawing instruments and materials</p> <p>2.3 Teaching models</p>
3. Methods of Assessment	<p>Competency may be assessed through:</p> <p>3.1 Practical assessment</p> <p>3.2 Observation</p> <p>3.3 Oral assessment</p>
4. Context of Assessment	<p>Competency may be assessed individually in the actual workplace or a simulated work place setting</p>
5. Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

## **USE COMMON METALLIC AND NON-METTALIC MATERIALS**

**UNIT CODE:** ENG/OS/MLF/CC/02/4/B

### **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

<b>ELEMENT</b> These describe the key outcomes which make up workplace function	<b>PERFORMANCE CRITERIA</b> These are assessable statements which specify the required level of performance for each of the elements ( <i><b>Bold and italicized terms are elaborated in the Range</b></i> )
1. Identify properties of engineering materials	1.1 Engineering materials type is identified as per the application 1.2 <i><b>Physical properties</b></i> of engineering material are determined 1.3 <i><b>Mechanical properties</b></i> of engineering materials are tested 1.4 Crystal structure of materials are identified
2. Identify ore extraction processes of metallic materials	2.1 Safety procedures to be observed are identified according to OSHA 2.2 Method of extraction is outlined as per <i><b>metal classification</b></i> 2.3 Procedure in extraction process is outlined as per extraction method 2.4 Extraction by- products are identified as per material extraction method
3. Identify methods of producing engineering materials	3.1 Method of producing different <i><b>non-metallic materials</b></i> are identified according to the type of material 3.2 Forms of supply of engineering materials are identified according to their application 3.3 <i><b>Finishing and Refinement</b></i> processes are identified based on material required.
4. Perform heat treatment	4.1 Safety requirements associated with heat treatment are observed in accordance to OSHA 2007 4.2 Tools, equipment and materials used for heat treatment are selected according to manufacturer's specification and workplace procedures 4.3 <b>Heat treatment processes</b> are identified as per the job specification and workplace procedures 4.4 Heat treatment of metals is performed as per the job specification and workplace procedures

<p>5. Prevent material corrosion</p>	<p>5.1 Safety rules and regulations are observed during corrosion prevention in material in accordance to OSHA 2007 act.</p> <p>5.2 <b>Types of corrosion</b> are identified as per the application of the material</p> <p>5.3 Agents of corrosion are identified as per the corrosion type</p> <p>5.4 <b>Methods of corrosion prevention</b> are identified as per the application of the material</p> <p>5.5 Corrosion prevention is performed as per the job specification and application area.</p>
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### 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
<p>Physical properties include but not limited to:</p>	<ul style="list-style-type: none"> <li>● Density</li> <li>● Color</li> <li>● Texture</li> <li>● Melting point</li> <li>● Thermo conductivity</li> <li>● Electrical resistivity</li> </ul>
<p>Mechanical properties include but not limited:</p>	<ul style="list-style-type: none"> <li>● Ductility</li> <li>● Malleability</li> <li>● Elasticity</li> <li>● Toughness</li> <li>● Hardness</li> <li>● Brittleness</li> <li>● Plasticity</li> <li>● Strength</li> </ul>
<p>Metal classification includes:</p>	<ul style="list-style-type: none"> <li>● Ferrous metals</li> <li>● Non-ferrous metals</li> </ul>
<p>Different non-metallic materials include but not limited to:</p>	<ul style="list-style-type: none"> <li>● Rubber</li> <li>● Plastics</li> <li>● Wood</li> <li>● ceramics</li> <li>● Glass</li> </ul>



Finishing processes includes but not limited to:	<ul style="list-style-type: none"> <li>● Lapping</li> <li>● Fine grinding</li> <li>● Polishing</li> </ul>
Heat treatment processes includes but not limited to:	<ul style="list-style-type: none"> <li>● Annealing</li> <li>● Tempering</li> <li>● Normalizing</li> <li>● Hardening</li> <li>● Case hardening</li> </ul>
Corrosion type includes but not limited to:	<ul style="list-style-type: none"> <li>● Galvanic</li> <li>● Stress corrosion cracking</li> </ul>
Methods of corrosion prevention includes but not limited to:	<ul style="list-style-type: none"> <li>● Painting</li> <li>● Electroplating</li> <li>● Galvanizing</li> <li>● Cathodic</li> <li>● Chromizing</li> </ul>

## 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.

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the learner</p> <p>1.1 Identified safety procedures to be observed according to OSHA</p> <p>1.2 Determined physical properties of engineering material as per the workplace requirements</p> <p>1.3 Tested mechanical properties of engineering materials as per the workplace requirements</p> <p>1.4 Outlined procedure in extraction process as per extraction method</p> <p>1.5 Identified forms of supply of engineering materials according to their application</p> <p>1.6 Performed heat treatment of metals as per the job specification and workplace procedures</p> <p>1.7 Identified agents of corrosion as per the corrosion type</p> <p>1.8 Performed corrosion prevention as per the job specification and application area</p>
<p>2. Resource Implications</p>	<p>2.1 Testing materials</p> <p>2.2 Measuring instruments</p> <p>2.3 Heat treatment equipment (furnaces, oxy-fuel gas system etc)</p> <p>2.4 Inspection tools</p>
<p>3. Methods of Assessment</p>	<p>Competency may be assessed through:</p> <p>3.1 Oral questioning</p> <p>3.2 Written test</p> <p>3.3 Practical assessment</p>
<p>4. Context of Assessment</p>	<p>Competency may be assessed individually in the actual workplace or through accredited institution</p>

5. Guidance information for assessment	Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended.
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## PERFORM BENCH WORK OPERATIONS

**UNIT CODE: ENG/OS/MLF/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, perform maintenance and perform housekeeping.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements ( <i><b>Bold and italicized terms are elaborated in the Range</b></i> )
1. Observe safety rules and regulations	1.1 Prescribed personal safety gear is worn as per work place procedure. 1.2 Prescribed safety measures for the operation of hand tools and bench drilling machines adhered to as per safety rules and regulations (OSHA) 1.3 Prescribed safe work environment is observed as per rules and regulations
2. Plan work operations	2.1 Working drawing are interpreted as per <i><b>drawing standards.</b></i> 2.2 Operation Plan is produced as per the working drawings. 2.3 Tools and equipment are selected as per the operation plan.
3. Mark out dimensions on work pieces	3.4 Measuring tools suitable for the work are selected 3.5 Measuring tools are inspected and calibrated as per the workplace procedures 3.6 Marking out tools are selected as per the operation plan 3.7 Dimensions are marked on the work piece as per the working drawing specifications
4. Set up work pieces on holding devices	4.1 Work piece is mounted on work holding devices 4.2 Work piece is clamped securely on <i><b>work holding devices</b></i>
5. Use hand tools	5.1 <i><b>Hand tools</b></i> are selected based on operation plan 5.2 Hand tool used as per the operation plan

6. Use bench drill	6.1 Hole centers are marked and center punched as per specifications 6.2 Drill bits are selected and mounted on the machine spindle 6.3 Work piece is mounted on holding device and clamped as per the work place procedures 6.4 <b>Hole is drilled</b> to specification 6.5 Hole is inspected to specification
7. Assemble metal parts and sub-assemblies	7.1 Fitted parts are <b>joined</b> and assembled as per the working drawing specifications 7.2 Final assembly inspected as per specification
8. Inspect finished work	8.1 Inspection tools and methods selected as per operation plan 8.2 Finished work is inspected as per specification 8.3 Adjustments are made based on inspection results
9. Perform maintenance	9.1 Tools and equipment are inspected as per the work place procedures 9.2 Faults on tools and equipment identified and reported as per the work place procedures 9.3 Tools and equipment are lubricated as per the workplace procedures
10. Perform house keeping	10.1 Work environment is cleaned as per the workplace procedures 10.2 Waste is segregated and disposed as the workplace environmental regulations 10.3 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.

<b>VARIABLE</b>	<b>RANGE</b>
1. Measuring tools may include but not limited to:	1.1 Steel rule 1.2 Vernier caliper 1.3 Micrometer screw gauge 1.4 Vernier height gauge
2. Drawing Standards may include but not limited to:	2.1 ISO 2.2 BS

	2.3 ANSI
3. Marking out tools may include but not limited to:	3.1 Scribers 3.2 Dividers 3.3 Dot punch 3.4 Centre punch

<b>VARIABLE</b>	<b>RANGE</b>
	3.5 Engineers square 3.6 Straight edge 3.7 Surface plate
4. Work holding devices may include but not limited to:	4.1 Bench vice 4.2 V-Block 4.3 Angle plate 4.4 G-clamp 4.5 Jigs and fixtures 4.6 Hand vice
5. Hand tools may include but not limited to:	5.1 Files 5.2 Saws 5.3 Hammers 5.4 Chisels 5.5 Taps and dies
6. Hole drilled may include but not limited to:	6.1 Location 6.2 Counter sinking 6.3 Counter boring 6.4 Reaming 6.5 Boring
7. Joining may include but not limited to:	7.1 Riveting 7.2 Use of mechanical fasteners 7.3 Use of adhesives 7.4 Soldering 7.5 Brazing 7.6 Welding (gas/arc)
8. Specifications may include but not limited to:	8.1 Dimensions 8.2 Tolerances 8.3 Geometry 8.4 Surface finish 8.5 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
- OSH act
- 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: 1.1 Adhered to prescribed safety measures for the operation of hand tools and bench drilling machines as per safety rules and regulations standards (OSHA) 1.2 Produced Operation Plan as per the working drawings 1.3 Marked dimensions on the work piece as per the working drawing specification 1.4 Clamped work piece securely on work holding devices as per the work place procedures 1.5 Cut work piece to specification 1.6 Drilled hole to specification 1.7 Joined and assembled the fitted parts as per the working drawing specifications 1.8 Inspected finished work as per the specification 1.9 Cleaned work environment as per the workplace procedures 1.10 Stored tools and equipment as per the workplace procedures
1. Resource Implications	1.1 Hand measuring tools 1.2 Hand marking tools 1.3 Hand tools 1.4 Inspection tools and equipment 1.5 Hand drilling machine 1.6 Bench Drilling machine 1.7 1.7 Work benches 1.8 1.8 Bench vices 1.9 ISO, BS and ANSI standards 1.10 Rules and procedures 1.11 Resource materials, manuals for bench, tools and equipment 1.12 Materials 1.13 Cutting tools



2. Methods of Assessment	Competency may be assessed through: 2.1 Observing the behavior of the learner 2.2 Oral presentations 2.3 Inspection of written operation procedures 2.4 Inspection of finished product 2.5 Observing housekeeping of the work area and/or machine tool
3. Context of Assessment	Competency may be assessed individually in the actual workplace or through accredited institution
4. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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## CORE UNITS OF COMPETENCY

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## FABRICATE SHEET METAL PARTS

UNIT CODE: ENG/OS/MLF/CR/01/04/A

### UNIT DESCRIPTION

This unit covers the competencies required by a Mechanical production (Lathe and Fabrication) 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

<b>ELEMENT</b> These describe the key outcomes which make up workplace function	<b>PERFORMANCE CRITERIA</b> These are assessable statements which specify the required level of performance for each of the elements. <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Observe safety rules and regulations	1.1 Prescribed personal safety gear is worn as per work place procedure. 1.2 Prescribed safe work environment is observed as per rules and regulations. 1.3 Prescribed workplace procedures are adhered to.
2. Use sheet metal machines, tools & equipment.	2.1 Types of <i>sheet metal machine tools</i> /equipment identified as per the manufacturer's manual 2.2 Parts of sheet metal machine/equipment identified as per manufactures manual 2.3 Functions of the parts of a sheet metal machine identified as the manufacturers manual 2.4 Sheet metal machines, tools and equipment selected as per the operation plan 2.5 Sheet metal machine, tools and equipment used as per manufacturer's specification manual.
3. Plan work operation	3.1 Technical drawings and geometric symbols are read and interpreted as per <i>drawing standards</i> . 3.2 <i>Operation Plan</i> is prepared as per the working drawings. 3.3 Pattern development layout is sketched as per the work specification
4. Mark out work pieces	4.1 Marking and measuring tools selected as per specifications 4.2 Work piece dimensions are measured as per the specifications

	4.3 Dimensions are marked on work piece as per the <i>drawing specifications</i>
5. Set- up sheet metal machine and equipment	5.1 Machine, tools and equipment are selected as per operation plan 5.2 Attachments are mounted as per machine operational manual
6. Fabricate sheet metal component (s)	6.1 Accessories mounted as per machine manual 6.2 Sheet metal work pieces produced as per operation plan 6.3 Sheet metal parts joined as per the specifications
7. Assess Quality of the fabricated component(s)	7.1 Finished work is cleaned according to work place procedures 7.2 Finished work is inspected to specification 7.3 Finished work is tested for function ability as per the Specifications
8. Maintain sheet metal machines, tools and equipment	8.1 Machines, tools and equipment cleaned as per the work place procedures 8.2 Machines and tools are inspected as per the work place procedures 8.3 Faults on machines and tools are identified and reported as per the workplace procedures 8.4 Machines and equipment are lubricated as per the manufacturers manual
9. Perform housekeeping	9.1 Work environment cleaned in accordance with work place procedures 9.2 Waste is segregated and disposed as per the work place environmental procedures 9.3 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.

<b>Variable</b>	<b>Range</b>
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1. Sheet metal machine tools include but not limited to:	1.1 Rolling Machine 1.2 Bending machine 1.3 Punching machine 1.4 Shearing machine
2. Drawing Standards includes but not limited to:	2.1 ISO 2.2 BS 2.3 ANSI
3. Operation Plan includes but not limited to:	3.1 Sequence of operations 3.2 Measuring tools 3.3 Hand tools 3.4 Cutting tools 3.5 Inspection tools
4. Drawing specifications includes but not limited to:	4.1 Dimensions 4.2 Tolerances 4.3 Geometry 4.4 Surface finishing 4.5 Functionality 4.6 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.

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the learner:</p> <ul style="list-style-type: none"> <li>1.1 Observed prescribed safety rules and procedures in sheet metal work as per the OSHA standards</li> <li>1.2 Used sheet metal machine, tools and equipment as per manufacturers manual</li> <li>1.3 Prepared operation Plan as per the working drawings</li> <li>1.4 Sketched Pattern development layout as per the work specification</li> <li>1.5 Marked dimensions on work piece as per the specifications</li> <li>1.6 Selected machine, tools and equipment as per operation plan</li> <li>1.7 Produced sheet metal work pieces as per operation plan</li> <li>1.8 Joined sheet metal parts as per the specifications</li> <li>1.9 Inspected finished work to specification</li> <li>1.10 Cleaned machines, tools and equipment as per the work place procedures</li> <li>1.11 Cleaned work environment in accordance with work place procedures</li> </ul>
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2. 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
3. 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
4. Context of Assessment	Competency may be assessed individually in the actual workplace or through accredited institutions
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

## PRODUCE COMPONENTS ON THE LATHE

**UNIT CODE:** ENG/OS/MLF/CR/02/4/B

### UNIT DESCRIPTION

This unit specifies the competencies required to identify lathe machine parts accessories and their functions, prepare operation procedure sheet, mount work pieces, perform lathe machine operations, assess quality of finished work, organize work area and maintain machine tool and accessories and observe safety rules and regulations.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b> These describe the key outcomes which make up workplace function	<b>PERFORMANCE CRITERIA</b> These are assessable statements which specify the required level of performance for each of the elements. <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Observe safety rules and regulations	1.1 Prescribed personal safety gear is worn as per work place procedure. 1.2 Prescribed safety measures for the operation of hand tools and drilling machines adhered to as per rules and regulations 1.3 Prescribed safe work environment is observed as per rules and regulations 1.4 Prescribed workplace procedures are adhered to
2. Identify machine parts, tools, accessories and their functions	2.1 A lathe is defined as per the manufacturers manual 2.2 Types of lathe are identified as per the manufacturers manual 2.3 Parts of a lathe are identified according to manufactures manual 2.4 Functions of the parts of a lathe are defined as per manufacturers operation manual 2.5 Lathe <i><b>cutting tools</b></i> and accessories are identified as per manufacturers manual and work specifications



3. Prepare operation plan	<p>3.1 Working drawing is read and <i>interpreted as per the technical drawing Standards</i></p> <p>3.2 <i>Operation plan</i> is prepared as per the standard operations procedure</p>
4. Mount work piece	<p>4.1 Work piece is mounted on the chuck or other accessories according to machining operation procedures</p> <p>4.2 Work piece is supported by tail stock as per the SOPs</p> <p>4.3 True running of the work piece is observed as per the work place procedures</p>
5. Perform machining to specifications	<p>5.1 Work piece machined to specified dimensions</p> <p>5.2 Work piece machined to specified surface roughness</p>
6. Assess quality of finished work	<p>6.1 Inspection tools and methods selected as per operation plan</p> <p>6.2 Finished work is inspected as per specifications</p> <p>6.3 Adjustments are made according to inspection Results</p>
7. Maintain machine tool and accessories	<p>7.1 Machine and accessories are inspected as per the work places procedures</p> <p>7.2 Faults on machines and accessories are identified according to standard operation procedures</p> <p>7.3 Machine parts oiled and lubricated as per the manufacturer's manual</p>
8. Perform house keeping	<p>8.1 Tools, equipment and accessories are cleaned and stored as per the work organization policy.</p> <p>8.2 Housekeeping is carried out as per the work place requirements</p> <p>8.3 Waste is segregated and disposed as per the disposal guidelines</p>

### **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.

<b>Variable</b>	<b>Range</b>
1. Technical drawing Standards includes but not limited to;	<p>1.1 ISO</p> <p>1.2 BS</p> <p>1.3 ANSI</p>

2. Cutting tools and accessories includes but not limited to;	2.1 Knurling tools 2.2 Threading 2.3 Turning 2.4 Boring 2.5 Parting
<b>Variable</b>	<b>Range</b>
	2.6 Drilling bits 2.7 Lathe dog 2.8 Face plate 2.9 Lathe steadies and centers
3. Specifications includes but not limited to;	3.1 Dimensions 3.2 Geometry 3.3 Surface finishing 3.4 Functionality
4. Operation plan includes but not limited to;	4.1 Sequence of operations 4.2 Measuring tool 4.3 Cutting tool including cutting data 4.4 Production time 4.5 Speed and feed rate 4.6 Cutting angles

## 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:

- Work piece material preparation
- Measuring and marking
- Technical drawing
- Work mounting
- Tool setting and tool grinding
- Use of lathe accessories and attachments
- Performing various lathe operations
- Inspecting finished work
- Maintaining machine tool
- Organizing work area

### 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
- Geometrical tolerance
- Metal cutting processes using HM & HSS cutting tools
- Measuring tools
- Preventive maintenance
- Inspection and quality control
- Lathe operations
- Taper turning
- 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	<p>Assessment requires evidence that the learner:</p> <ul style="list-style-type: none"> <li>1.1 observed safety as per work place procedures</li> <li>1.2 Developed operation plan as per the specifications</li> <li>1.3 Calculated speed and feed rate as per the specifications</li> <li>1.4 Selected cutting tools, speed &amp; feed rates as per the working drawing</li> <li>1.5 Performed machining operations as per the work place procedures</li> <li>1.6 Inspected finished product as per the specifications</li> <li>1.7 Set up machine tools as per the work place procedures</li> <li>1.8 Mounted work piece as per the work place procedures</li> <li>1.9 Performed machine, tool and equipment maintenance as per the work place procedures</li> </ul>
2. Resource Implications	<ul style="list-style-type: none"> <li>2.1 Lathe</li> <li>2.2 Cutting tools</li> <li>2.3 Measuring tools</li> <li>2.4 Material</li> <li>2.5 Resource materials, manuals for cutting tools &amp; lathe</li> <li>2.6 Work place procedures</li> </ul>

3. Methods of Assessment	<p>Competency may be assessed through:</p> <p>3.1 Observing the behavior of the learner</p> <p>3.2 Inspection of produced operation procedures</p> <p>3.3 The quality control of the finished product with regards to drawing specification and tolerances.</p> <p>3.4 Observing housekeeping rules and regulation</p> <p>3.5 Observing maintenance of the lathe</p>
4. Context of Assessment	Competency may be assessed individually in the actual workplace or through accredited institution
5. Guidance information for assessment	Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended.

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