THE REPUBLIC OF KENYA

NATIONAL OCCUPATIONAL STANDARDS

FOR

TEXTILE TECHNICIAN

LEVEL 6

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 blueprint, Vision 2030 and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution of Kenya 2010 and this resulted 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 programs.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that these

These Occupational Standards were developed for developing a competency-based curriculum for Textile Technology level 6. 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 Textile sector's growth and development.

PRINCIPAL SECRETARY
VOCATIONAL AND TECHNICAL TRAINING
MINISTRY OF EDUCATION

PREFACE

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

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

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Textile Engineering Sector Skills Advisory Committee (SSAC) have developed these Occupational Standards for Textile technician. These standards will be the bases for development of competency-based curriculum for Textile Technology Level 6.

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, Textile SSAC, expert workers and all those who participated in the development of these Occupational Standards.

CHAIRPERSON
TVET CDACC

ACKNOWLEDGMENT

These Occupational Standards were developed through combined effort of various stakeholders from private and public organizations. I am 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 Textile Technician 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 participation of these Standards.

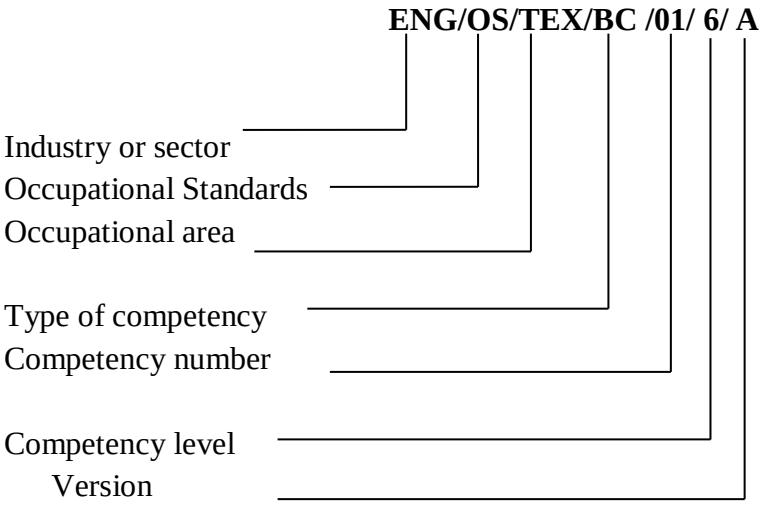
I acknowledge all other institutions that in one way or another contributed to the development of these Occupational Standards.

CHAIRPERSON
TEXTILE SECTOR SKILLS ADVISORY COMMITTEE

ABBREVIATION AND ACRONYMS

AC	Air conditioning
BC	Basic Competency
CC	Common Competency
CDACC	Curriculum Development, Assessment and Certification Council
CPU	Control Powering Unit
CR	Core Competency
DTI	Dial test indicator
ENG	Engineering
HVI	High Volume Instrument
ICT	Information and Communication Technology
IT	Information Technology
KCSE	Kenya Certificate of Secondary Education
KNQF	Kenya National Qualification Framework
OS	Occupational Standards
PPE	Personal protective equipment
SOP	Standard Operating Procedures
TEX	Textile
TQM	Total Quality Management
TVET	Technical and Vocational Education and Training

KEY TO UNIT CODE



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OVERVIEW

The Textile Technician Level 6 consists of competencies that a person must achieve to enable him/her to work in a Textile Industry. It entails textile material testing, producing textile yarn (spinning), producing woven fabric (weaving), producing knitted fabric, producing nonwoven fabric, processing textile fabric, operating textile machines/equipment and managing textile production process

The units of competency comprising Textile Technician level 6 qualifications include the following basic, common and core competencies:

BASIC UNITS OF COMPETENCY	
Unit of competency Code	**Units of competency**
ENG/OS/TEX/BC/01/6/A	Demonstrate Communication Skills
ENG/OS/TEX/BC/02/6/A	Demonstrate Digital Literacy
ENG/OS/TEX/BC/03/6/A	Demonstrate Entrepreneurial Skills
ENG/OS/TEX/BC/04/6/A	Demonstrate Employability Skills
ENG/OS/TEX/BC/05/6/A	Demonstrate Environmental Literacy
ENG/OS/TEX/BC/06/6/A	Demonstrate Occupational Safety and Health Practices
COMMON UNITS OF COMPETENCY	
ENG/OS/TEX/CC/01/6/A	Prepare and Interpret Technical Drawing
ENG/OS/TEX/CC/02/6/A	Apply Engineering Mathematics
ENG/OS/TEX/CC/03/6/A	Apply Mechanical Science Principles
ENG/OS/TEX/CC/04/6/A	Apply Fluid Mechanics Principles
ENG/OS/TEX/CC/05/6/A	Apply Material Science Principles
CORE UNITS OF COMPETENCY	
ENG/OS/TEX/CR/01/6/A	Perform Textile Testing
ENG/OS/TEX/CR/02/6/A	Produce Textile Yarn (Spinning)
ENG/OS/TEX/CR/03/6/A	Produce Woven Fabric (Weaving)
ENG/OS/TEX/CR/04/6/A	Produce Knitted Fabric
ENG/OS/TEX/CR/05/6/A	Produce Nonwoven Fabric
ENG/OS/TEX/CR/06/6/A	Process Textile Fabric
ENG/OS/TEX/CR/07/6/A	Manage Textile Production Process

BASIC UNITS OF COMPETENCY

DEMONSTRATE COMMUNICATION SKILLS

UNIT CODE: ENG/OS/TEX/BC/01/6/A

UNIT DESCRIPTION

This unit covers the competencies required to demonstrate communication skills. It involves meeting communication needs of clients and colleagues, developing communication strategies, establishing and maintaining communication pathways, conducting interviews, facilitating group discussion and representing the organization.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range***
1. Meet communication needs of clients and colleagues	1.1 Specific communication needs of clients and colleagues are identified and met based on workplace requirements 1.2 Different communication approaches are identified and applied according to clients' needs 1.3 Conflict is identified and addressed as per the standards of the organization
2. Develop communication strategies	2.1 Strategies for effective internal and external dissemination of information are developed as per organization's requirements 2.2 Special communication needs are considered in developing strategies according workplace procedures 2.3 ***Communication strategies*** are analyzed, evaluated and revised based the workplace needs
3. Establish and maintain communication pathways	3.1 Pathways of communication are established as per organization policy 3.2 Pathways are maintained and reviewed according to organization procedures
4. Promote use of communication strategies	4.1 Information is provided to all areas of the organization as per strategy requirements 4.2 Effective communication techniques are articulated and modeled according work requirements 4.3 Personnel are given guidance about adapting communication strategies as per organization procedures

5. Conduct interview	5.1 A range of appropriate communication strategies are employed in ***interview situations*** based on the workplace requirements 5.2 Records of interviews are made and maintained in accordance with organizational procedures 5.3 Effective questioning, listening and nonverbal communication techniques are used as per needs
6. Facilitate group discussion	6.1 Mechanisms to enhance ***effective group interaction*** are identified and implemented according to workplace requirements 6.2 Strategies to encourage group participation are identified and used as per organizations' procedures 6.3 Meetings objectives and agenda are set and followed based on workplace requirements 6.4 Relevant information is provided and feedback obtained according to set protocols 6.5 Evaluation of group communication strategies is undertaken in accordance with workplace guidelines 6.6 Specific communication needs of individuals are identified and addressed as per individual needs
7. Represent the organization	5.1 7Relevant presentation are researched and presented based on internal or external communication forums requirements 5.2 Presentation is delivered in a clear and sequential manner as per the predetermined time 5.3 Presentation is made as per appropriate media 5.4 Difference views are respected based on workplace procedures 5.5 Written communication is done as per organizational standards 5.6 Inquiries are responded according to organizational standard

RANGE

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

Variable	**Range**
1. Communication strategies may	• Language switch • Comprehension check

include but not limited to:	• Repetition • Asking confirmation • Paraphrase • Clarification request • Translation • Restructuring • Approximation • Generalization
2. Effective group interaction may include but not limited to:	• Identifying and evaluating what is occurring within an interaction in a nonjudgmental way • Using active listening • Making decision about appropriate words, behavior • Putting together response which is culturally appropriate • Expressing an individual perspective • Expressing own philosophy, ideology and background and exploring impact with relevance to communication
3. Situations may include but not limited to:	• Establishing rapport • Eliciting facts and information • Facilitating resolution of issues • Developing action plans • Diffusing potentially difficult situations

REQUIRED SKILLS AND KNOWLEDGE

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

Required Skills

The individual needs to demonstrate the following skills:

- Communication
- Active listening
- Interpretation
- Negotiation
- Writing

Required Knowledge

The individual needs to demonstrate knowledge of:

- Communication process
- Dynamics of groups

- Styles of group leadership
- 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: 1.1 Developed communication strategies to meet the organization requirements and applied in the workplace 1.2 Established and maintained communication pathways for effective communication in the workplace 1.3 Used communication strategies involving exchanges of complex oral information
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Materials relevant to the proposed activity or tasks
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Direct observation 3.2 Oral questioning 3.3 Written texts
4. Context of Assessment	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
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/TEX/BC/02/6/A

UNIT DESCRIPTION

This unit describes competencies required to demonstrate digital literacy. It involves, identifying computer software and hardware, applying security measures to data, hardware, and software in automated environment, applying computer software in solving task, applying internet and email in communication at workplace, applying desktop publishing in official assignments and preparing presentation packages.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range***
1. Identify appropriate 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 Appropriate computer software is identified according to manufacturer's specification 1.4 Appropriate computer hardware 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 ***Data security and privacy are classified*** in accordance with the prevailing technology 2.2 ***Security threats*** reidentified ***and control measures*** are applied in accordance with laws governing protection of ICT 2.3 Computer threats and crimes are detected in accordance to Information Management security guidelines 2.4 Protection against computer crimes is undertaken in accordance with laws governing protection of ICT
3. Apply computer software in solving tasks	3.1 ***Word processing concepts*** are applied in resolving workplace tasks, report writing and documentation as per the job requirements 3.2 ***Word processing utilities*** 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 3.6 Database design and manipulation is undertaken in accordance with office procedures 3.7 Data sorting, indexing, storage, retrieval and security is provided in accordance with workplace procedures
4. Apply internet and email in communication at workplace	4.1 Electronic mail addresses are opened and applied in workplace communication in accordance with office policy 4.2 Office internet functions are defined and executed in accordance with office procedures 4.3 ***Network configuration*** is determined in accordance with office operations procedures 4.4 Official World Wide Web is installed and managed according to workplace procedures
5. Apply Desktop publishing in official assignments	5.1 Desktop publishing functions and tools are identified in accordance with manufactures specifications 5.2 Desktop publishing tools are developed in accordance with work requirements 5.3 Desktop publishing tools are applied in accordance with workplace requirements 5.4 Typeset work is enhanced in accordance with workplace standards
6. Prepare presentation packages	6.1 Types of presentation packages are identified in accordance with office requirements 6.2 Slides are created and formulated in accordance with workplace procedures 6.3 Slides are edited and run-in accordance with work procedures 6.4 Slides and handouts are printed according to work requirements

RANGE

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

Variable	Range
1. Appropriate computer hardware may include but not limited to:	llection of physical parts of a computer system such as: • Computer case, monitor, keyboard, and mouse • All the parts inside the computer case, such as the hard disk drive, motherboard and video card
2. Data security and privacy may include but not limited to:	• Confidentiality of data • Cloud computing • Integrity -but-curious data surfing
3. Security and control measures may include but not limited to:	• Counter measures against cyber terrorism • Risk reduction • Cyber threat issues • Risk management • Pass-wording
4. Security threats may include but not limited to:	• Cyber terrorism • Hacking

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: 1.1 Identified and controlled security threats 1.2 Detected and protected computer crimes 1.3 Applied word processing in office tasks

	1.4 Designed, prepared work sheet and applied data to the cells in accordance to workplace procedures 1.5 Opened electronic mail for office communication as per workplace procedure 1.6 Installed internet and World Wide Web for office tasks in accordance with office procedures 1.7 Integrated emerging issues in computer ICT applications 1.8 Applied laws governing protection of ICT
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace where assessment can take place 2.2 Appropriately simulated environment where assessment can take place
3. Methods of Assessment	mpetency may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
4. Context of Assessment	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

DEMONSTRATE ENTREPRENEURIAL SKILLS

UNIT CODE : ENG/OS/TEX/BC/03/6/A

UNIT DESCRIPTION

This unit covers the competencies required to demonstrate understanding of entrepreneurship. It involves demonstrating understanding of an entrepreneur, entrepreneurship, and self-employment, identifying entrepreneurship opportunities, creating entrepreneurial awareness, applying entrepreneurial motivation, developing business innovative strategies and developing business plan.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
1. Demonstrate understanding of an Entrepreneur	1. 1 Entrepreneurs and Business persons are distinguished as per principles of entrepreneurship 1. 2 ***Types of entrepreneurs*** are identified as per principles of entrepreneurship 1. 3 Ways of becoming an Entrepreneur are identified as per principles of Entrepreneurship 1. 4 ***Characteristics of Entrepreneurs*** are identified as per principles of Entrepreneurship 1. 5 Factors affecting Entrepreneurship development are explored as per principles of Entrepreneurship
2. Demonstrate understanding of Entrepreneurship and self-employment	2. 1 Entrepreneurship and self-employment are distinguished as per principles of entrepreneurship 2. 2 Importance of self-employment is analysed based on business procedures and strategies 2. 3 ***Requirements for entry into self-employment*** are identified according to business procedures and strategies 2. 4 Role of an Entrepreneur in business is determined according to business procedures and strategies 2. 5 Contributions of Entrepreneurs to National development are identified as per business procedures and strategies

	2. 6 Entrepreneurship culture in Kenya is explored as per business procedures and strategies 2. 7 Born or made Entrepreneurs are distinguished as per entrepreneurial traits
3. Identify Entrepreneurship opportunities	3.1 Sources of business ideas are identified as per business procedures and strategies 3.2 Business ideas and opportunities are generated as per business procedures and strategies 3.3 Business life cycle is analysed as per business procedures and strategies 3.4 Legal aspects of business are identified as per procedures and strategies 3.5 Product demand is assessed as per market strategies 3.6 Types of ***business environment*** are identified and evaluated as per business procedures 3.7 Factors to consider when evaluating business environment are explored based on business procedure and strategies 3.8 Technology in business is incorporated as per best practice
4. Create entrepreneurial awareness	4.1 ***Forms of businesses*** are explored as per business procedures and strategies 4.2 Sources of business finance are identified as per business procedures and strategies 4.3 Factors in selecting source of business finance are identified as per business procedures and strategies 4.4 ***Governing policies*** on Small Scale Enterprises (SSEs) are determined as per business procedures and strategies 4.5 Problems of starting and operating SSEs are explored as per business procedures and strategies
5. Apply entrepreneurial motivation	5.1 ***Internal and external motivation*** factors are determined in accordance with motivational theories 5.2 Self-assessment is carried out as per entrepreneurial orientation

	5.3 Effective communications are carried out in accordance with communication principles 5.4 Entrepreneurial motivation is applied as per motivational theories
6. Develop innovative business strategies	6.1 Business innovation strategies are determined in accordance with the organization strategies 6.2 Creativity in business development is demonstrated in accordance with business strategies 6.3 ***Innovative business strategies*** are developed as per business principles 6.4 Linkages with other entrepreneurs are created as per best practice 6.5 ICT is incorporated in business growth and development as per best practice
7. Develop Business Plan	7.1 Identified Business is described as per business procedures and strategies 7.2 Marketing plan is developed as per business plan format 7.3 Organizational/Management plan is prepared in accordance with business plan format 7.4 Production/operation plan in accordance with business plan format 7.5 Financial plan is prepared in accordance with the business plan format 7.6 Executive summary is prepared in accordance with business plan format 7.7 Business plan is presented as per best practice

RANGE

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

Variable	**Range**
1. Types of entrepreneurs may include but not limited to:	• Innovators • Imitators • Craft

	• Opportunistic • Speculators
2. Characteristics of Entrepreneurs may include but not limited to:	• Creative • Innovative • Planner • Risk taker • Networker • Confident • Flexible • Persistent • Patient • Independent • Future oriented • Goal oriented
3. Requirements for entry into self-employment may include but not limited to	• Technical skills • Management skills • Entrepreneurial skills • Resources • Infrastructure
4. Internal and external motivation may include but not limited to:	• Interest • Passion • Freedom • Prestige • Rewards • Punishment • Enabling environment • Government policies
5. Business environment may include but not limited to:	• External • Internal • Intermediate
6. Forms of businesses may include but not limited to:	• Sole proprietorship • Partnership • Limited companies • Cooperatives
7. Governing policies may include but not limited to:	• Increasing scope for finance • Promoting cooperation between entrepreneurs and private sector • Reducing regulatory burden on entrepreneurs

	• Developing IT tools for entrepreneurs
8. Innovative business strategies may include but not limited to:	• New products • New methods of production • New markets • New sources of supplies • Change in industrialization

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
- Management
- Problem-solving
- Root-cause analysis
- Communication

Required Knowledge

The individual needs to demonstrate knowledge of:

- Decision making
- Business communication
- Change management
- Competition
- Risk
- Net working
- Time management
- Leadership
- Factors affecting entrepreneurship development
- Principles of Entrepreneurship
- Features and benefits of common operational practices, e. g., continuous improvement (kaizen), waste elimination,
- Conflict resolution
- Health, safety and environment (HSE) principles and requirements
- Customer care strategies
- Basic financial management
- Business strategic planning
- Impact of change on individuals, groups and industries
- Government and regulatory processes

- Local and international market trends
- Product promotion strategies
- Market and feasibility studies
- Government and regulatory processes
- Local and international business environment
- Relevant developments in other industries
- Regional/ County business expansion strategies

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	1. 1 Assessment requires evidence that the candidate: 1. 2 Distinguished entrepreneurs and businesspersons correctly 1. 3 Identified ways of becoming an entrepreneur appropriately 1. 4 Explored factors affecting entrepreneurship development appropriately 1. 5 Analysed importance of self-employment accurately 1. 6 Identified requirements for entry into self-employment correctly 1. 7 Identified sources of business ideas correctly 1. 8 Generated Business ideas and opportunities correctly 1. 9 Analysed business life cycle accurately 1. 10 Identified legal aspects of business correctly 1. 11 Assessed product demand accurately 1. 12 Determined Internal and external motivation factors appropriately 1. 13 Carried out communications effectively 1. 14 Identified sources of business finance correctly 1. 15 Determined Governing policy on small scale enterprise appropriately 1. 16 Explored problems of starting and operating SSEs effectively 1. 17 Developed Marketing, Organizational/Management, Production/Operation and Financial plans correctly 1. 18 Prepared executive summary correctly

	1. 19 Determined business innovative strategies appropriately 1. 20 Presented business plan effectively
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace where assessment can take place 2.2 Appropriately simulated environment where assessment can take place
3. Methods of Assessment	3.1 Written tests 3.2 Oral questions 3.3 Third party report 3.4 Interviews 3.5 Portfolio of Evidence
4. Context of Assessment	Competency may be assessed 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

DEMONSTRATE EMPLOYABILITY SKILLS

UNIT CODE: ENG/OS/TEX/BC/04/6/A

UNIT DESCRIPTON

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating interpersonal communication, critical safe work habits, leading a workplace team, planning and organizing work, maintaining professional growth and development, demonstrating workplace learning, problem solving skills and managing ethical performance.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function.	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range***
1. Conduct self-management	1.1 Personal vision, mission and goals are formulated based on potential and in relation to organization objectives 1.2 Emotional intelligence is demonstrated as per workplace requirements. 1.3 Individual performance is evaluated and monitored according to the agreed targets. 1.4 Assertiveness is developed and maintained based on the requirements of the job. 1.5 Accountability and responsibility for own actions are demonstrated based on workplace instructions. 1.6 Self-esteem and a positive self-image are developed and maintained based on values. 1.7 Time management, attendance and punctuality are observed as per the organization policy. 1.8 Goals are managed as per the organization's objective 1.9 Self-strengths and weaknesses are identified based on personal objectives
2. Demonstrate interpersonal	2.1 Writing skills are demonstrated as per communication policy 2.2 Negotiation and persuasion skills are demonstrated as per communication policy

communication	2.3 Internal and external stakeholders' needs are identified and interpreted as per the communication policy 2.4 Communication networks are established based on workplace policy 2.5 Information is shared as per communication policy
3. Demonstrate critical safe work habits	3.1 Stress is managed in accordance with workplace policy. 3.2 Punctuality and time consciousness is demonstrated in line with workplace policy. 3.3 Personal objectives are integrated with organization goals based on organization's strategic plan. 3.4 ***Resources*** are utilized in accordance with workplace policy. 3.5 Work priorities are set in accordance to workplace goals and objectives. 3.6 Leisure time is recognized and utilized in line with personal objectives. 3.7 ***Drugs and substances of abuse*** are identified and avoided based on workplace policy. 3.8 HIV and AIDS prevention awareness is demonstrated in line with workplace policy. 3.9 Safety consciousness is demonstrated in the workplace based on organization safety policy. 3.10 ***merging issues*** are identified and dealt with in accordance with organization policy.
4. Lead a workplace team	4.1 Performance targets for the ***team*** are set based on organization's objectives 4.2 Duties are assigned in accordance with the organization policy. 4.3 ***Forms of communication*** in a team are established according to organization's policy. 4.4 Team performance is evaluated based on set targets as per workplace policy. 4.5 Conflicts are resolved between team members in line with organization policy. 4.6 Gender related issues are identified and mainstreamed in accordance workplace policy. 4.7 Human rights and fundamental freedoms are identified and respected as Constitution of Kenya 2010. 4.8 Healthy relationships are developed and maintained in line with workplace.

5. Plan and organize work	5.1 Work plans are prepared based on activities and budget. 5.2 Assigned tasks are interpreted and expectations identified as per the workplace instructions. 5.3 Task occupational safety and health requirements are identified and observed regulations. 5.4 Work resources are identified, mobilized, allocated and utilized based on organization work plans. 5.5 Work activities are monitored and evaluated in line with work plans and workplace policy. 5.6 Work plans are reviewed based on target and available resources.
6. Maintain professional growth and development	6.1 Personal training needs are identified and assessed in line with the requirements of the job. 6.2 ***Training and career opportunities*** are identified and utilized based on job requirements. 6.3 Resources for training are mobilized and allocated based organizations and individual skills needs. 6.4 Licensees and certifications relevant to job and career are obtained and renewed as per policy. 6.5 Work priorities and personal commitments are balanced and managed based on requirements of the job and personal objectives. 6.6 Recognitions are sought as proof of career advancement in line with professional requirements.
7. Demonstrate workplace learning	7.1 Learning opportunities are sought and managed based on job requirement and organization policy. 7.2 Improvement in performance is demonstrated based on courses attended. 7.3 Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job 7.4 Time and effort is invested in learning new skills based on job requirements 7.5 Initiative is taken to create more effective and efficient processes and procedures in line with workplace policy. 7.6 New systems are developed and maintained in accordance with the requirements of the job. 7.7 Awareness of personal role in workplace ***innovation*** is demonstrated based on requirements of the job.
8. Demonstrate problem solving skills	8.1 Creative, innovative and practical solutions are developed based on the problem 8.2 Independence and initiative in identifying and solving problems is demonstrated based on requirements of the job. 8.3 Team problems are solved as per the workplace guidelines

	8.4 Problem solving strategies are applied as per the workplace guidelines 8.5 Problems are analyzed and assumptions tested as per the context of data and circumstances
9. Manage ethical performance	9.1 Policies and guidelines are observed as per the workplace requirements 9.2 Self-worth and professionalism is exercised in line with personal goals and organizational policies 9.3 Code of conduct is observed as per the workplace requirements 9.4 Integrity is demonstrated as per legal requirement

RANGE

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

Variable	**Range**
1. Drug and substance abuse may include but not limited to:	Commonly abused • Alcohol • Tobacco • Miraa • Over-the-counter drugs • Cocaine • Bhang • Glue
2. Feedback may include but not limited to:	• Verbal • Written • Informal • Formal
3. Relationships may include but not limited to:	• Man/Woman • Trainer/trainee • Employee/employer • Client/service provider • Husband/wife • Boy/girl • Parent/child • Sibling relationships

4. Forms of communication may include but not limited to:	• Written • Visual • Verbal • Non verbal • Formal and informal
5. Team may include but not limited to:	• Small work group • Staff in a section/department • Inter-agency group
6. Personal growth may include but not limited to:	• Growth in the job • Career mobility • Gains and exposure the job gives • Net workings • Benefits that accrue to the individual as a result of noteworthy performance
7. Personal objectives may include but not limited to:	• Long term • Short term • Broad • Specific
8. Trainings and career opportunities may includes but not limited to	• Participation in training programs • Serving as Resource Persons in conferences and workshops
9. Resource may include may but not limited to:	• Human • Financial • Technology
10. Innovation may include but not limited to:	• New ideas • Original ideas • Different ideas • Methods/procedures • Processes • New tools
11. Emerging issues may include but not limited to:	• Terrorism • Social media • National cohesion • Open offices
12. Range of media for learning may include but not limited to:	• Mentoring • peer support and networking • IT and courses

REQUIRED SKILLS AND KNOWLEDGE

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

Required Skills

The individual needs to demonstrate the following skills:

- Interpersonal
- Communication
- Critical thinking
- Organizational
- Negotiation
- Monitoring
- Evaluation
- Record keeping
- Problem solving
- Decision Making
- Resource utilization
- Resource mobilization

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
- Workplace communication
- Concept of time
- Time management
- Decision making
- Types of resources
- Work planning
- Organizing work
- Monitoring and evaluation
- Record keeping
- Gender mainstreaming
- HIV and AIDS
- Drug and substance abuse
- Professional growth and development
- Technology in the workplace
- Innovation

- Emerging issues

EVIDENCE GUIDE

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

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Conducted self-management 1.2 Demonstrated interpersonal communication 1.3 Demonstrated critical safe work habits 1.4 Demonstrated the ability to lead a workplace team 1.5 Planned and organized work 1.6 Maintained professional growth and development 1.7 Demonstrated workplace learning 1.8 Demonstrated problem solving skills 1.9 Demonstrated the ability to manage performance ethically
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace where assessment can take place 2.2 Appropriately simulated environment where assessment can take place
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
4. Context of Assessment	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

DEMONSTRATE ENVIRONMENTAL LITERACY

UNIT CODE: ENG/OS/TEX/BC/05/6/A

UNIT DESCRIPTION

This unit specifies the competencies required to demonstrate environmental literacy. It involves, controlling environmental hazard and environmental pollution, demonstrating sustainable resource use, evaluating current practices in relation to resource usage, identifying environmental legislations/conventions for environmental concerns, implementing specific environmental programs, monitoring activities on environmental protection/Programs, analyzing resource use and developing resource conservation plans

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function.	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range***
1. Control environmental hazard	1. 1 Storage methods for environmentally hazardous materials are strictly followed according to environmental regulations and OSHS. 1. 2 Disposal methods of hazardous wastes are followed according to environmental regulations and OSHS. 1. 3 ***PPE*** is used according to OSHS.
2. Control environmental Pollution	2.1 Environmental pollution ***control measures*** are implemented in accordance with international protocols. 2.2 Procedures for solid waste management are observed according Environmental Management and Coordination Act 1999 2.3 Methods for minimizing noise pollution is complied with based on *Noise* and Excessive Vibration *Pollution and Control Regulations*, 2009
3. Demonstrate sustainable resource use	3.1 Methods for minimizing wastage are complied with based on organizational waste management guide

	3.2 Waste management procedures are employed following principles of 3Rs (Reduce, Reuse, Recycle) 3.3 Methods for economizing and reducing resource consumption are practiced as per the Constitution of Kenya 2010 Article 69 .
4. Evaluate current practices in relation to resource usage	4.1 Information on resource efficiency systems and procedures are collected and provided as per work groups/sector 4.2 Current resource usage is measured and recorded as per 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 analyzed following enterprise protocol.
5. Identify environmental legislations/conventions for environmental concerns	5.1 Environmental legislations/conventions and local ordinances are identified according to the different environmental aspects/impact 5.2 Industrial standard/environmental practices 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 are analyzed 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 7.7 concerned/proper authorities
8. Analyze resource use	8.1 All resource consuming processes are Identified as per the organizational work plan

	8.2 Quantity and nature of resource consumed is determined based on processes 8.3 Resource flow is analyzed as per different parts of the process. 8.4 Wastes are classified according to NEMA regulations on waste management.
9. Develop resource Conservation plans	9.1. Efficiency of use/conversion of resources is determined according to industry protocol. 9.2. Causes of low efficiency of use of resources are Determined based on industry protocol. 9.3. Plans for increasing the efficiency of resource use are developed based on findings.

RANGE

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

Variable	**Range**
1. PPE may include but not limited to	• Mask • Gloves • Goggles • Safety hat • Overall • Hearing protector
2. Control measures may include but not limited to	• Methods for minimizing or stopping spread and ingestion of airborne particles • Methods for minimizing or stopping spread and ingestion of gases and fumes • Methods for minimizing or stopping spread and ingestion of liquid wastes

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:

- Measuring
- Recording
- Analytical

- Monitoring
- Communication
- Writing

Required Knowledge

The individual needs to demonstrate knowledge of:

- PPEs
- Environmental regulations
- OSHS
- Pollution
- Waste management
- Principle of 3Rs
- Types of resources
- Techniques in measuring current usage of resources
- Environmental hazards
- Regulatory requirements

EVIDENCE GUIDE

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

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Controlled environmental hazard 1.2 Controlled environmental pollution 1.3 Demonstrated sustainable resource use 1.4 Evaluated current practices in relation to resource usage 1.5 Demonstrated knowledge of environmental legislations and local ordinances according to the different environmental issues /concerns. 1.6 Described industrial standard environmental practices according to the different environmental issues/concerns. 1.7 Resolved problems/ constraints encountered based on management standard procedures 1.8 Implemented and monitored environmental practices on a periodic basis as per company guidelines 1.9 Recommended solutions for the improvement of the program 1.10 onitored and reported to proper authorities any environmental incidents

2. Resource Implications	The following resources should be provided: 2.1 Workplace with storage facilities 2.2 Tools, materials and equipment relevant to the tasks (e.g. Cleaning tools, cleaning materials, trash bags) 2.3 PPE, manuals and references 2.4 Legislation, policies, procedures, protocols and local ordinances relating to environmental protection 2.5 Case studies/scenarios relating to environmental Protection
3 Methods of Assessment	Competency in this unit may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
4 Context of Assessment	Competency may be assessed 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5 Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

DEMONSTRATE OCCUPATIONAL SAFETY AND HEALTH PRACTICES

UNIT CODE: ENG/OS/TEX/BC/06/6/A

UNIT DESCRIPTION

This unit specifies the competencies required to demonstrate occupational health and safety practices. It involves identifying workplace hazards and risks, identifying and implementing appropriate control measures to hazards and risks and implementing OSH programs, procedures and policies/guidelines.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function.	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range***
1. Identify workplace hazards and risk	1.1 ***Hazards*** in the workplace are identified ***based their indicators*** 1.2 Risks and hazards are evaluated based on legal requirements. 1.3 ***OSH concerns*** raised by workers are addressed as per legal requirements.
2. Control OSH hazards	2.1 Hazard prevention ***and control measures*** are implemented as per legal requirement. 2.2 Risk assessment is conducted and a risk matrix developed based on likely impact. 2.3 ***Contingency measures***, including ***emergency procedures*** during workplace ***incidents and emergencies*** are recognized and established in accordance with organization procedures.
3. Implement OSH programs	3.1 Company OSH program are identified, evaluated and reviewed based on legal requirements. 3.2 Company OSH programs are implemented as per legal requirements. 3.3 Workers are capacity built on OSH standards and procedures as per legal requirements 3.4 ***OSH-related records*** are maintained as per legal requirements.

RANGE

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

Variable	Range
1. Hazards may include but not limited to:	• Physical hazards – impact, illumination, pressure, noise, • vibration, extreme temperature, radiation • Biological hazards- bacteria, viruses, plants, parasites, mites, molds, fungi, insects • Chemical hazards – dusts, fibers, mists, fumes, smoke, gasses, vapors • Ergonomics • Psychological factors – over exertion/ excessive force, awkward/static positions, fatigue, direct pressure, • varying metabolic cycles • Physiological factors – monotony, personal relationship, work out cycle • Safety hazards (unsafe workplace condition) – confined space, excavations, falling objects, gas leaks, electrical, poor storage of materials and waste, spillage, waste and debris • Unsafe workers' act (Smoking in off-limited areas, Substance and alcohol abuse at work)
2. Indicators may include but not limited to:	• Increased of incidents of accidents, injuries • Increased occurrence of sickness or health complaints/ symptoms • Common complaints of workers related to OSH • High absenteeism for work-related reasons
3. OSH concerns may include but not limited to:	• Workers' experience/observance on presence of work hazards • Unsafe/unhealthy administrative arrangements (prolonged work hours, no break time, constant overtime, scheduling of tasks) • Reasons for compliance/non-compliance to use of PPEs or other OSH procedures/policies/guidelines

4. Safety gears /PPE (Personal Protective Equipment) may include but not limited to:	• Arm/Hand guard, gloves • Eye protection (goggles, shield) • Hearing protection (ear muffs, ear plugs) • Hair Net/cap/bonnet • Hard hat • Face protection (mask, shield) • Apron/Gown/coverall/jump suit • Anti-static suits • High-visibility reflective vest
5. Appropriate risk controls may include but not limited to:	• Appropriate risk controls in order of impact are as follows: • Eliminate the hazard altogether (i.e., get rid of the dangerous machine) • 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) • Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one) • 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) • Use engineering controls to reduce the risk (i.e., attach guards to the machine to protect users) • Use personal protective equipment (i.e., wear • gloves and goggles when using the machine)
6. Contingency measures may include but not limited to:	• Evacuation • Isolation • Decontamination • (Calling designed) emergency personnel
7. Incidents and emergencies may include but not limited to:	• Chemical spills • Equipment/vehicle accidents • Explosion • Fire • Gas leak • Injury to personnel • Structural collapse • Toxic and/or flammable vapors emission.

8. OSH-related Records may include but not limited to:	• Medical/Health records • Incident/accident reports • Sickness notifications/sick leave application • OSH-related trainings obtained

REQUIRED SKILLS AND KNOWLEDGE

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

Required Skills

The individual needs to demonstrate the following skills:

- Communication
- Interpersonal
- Presentation
- Risk assessment
- Evaluation
- Critical thinking
- Problem solving
- Negotiation

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 counseling 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.

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Identified hazards in the workplace based their indicators 1.2 Evaluated workplace hazards based on legal requirements.

	1.3 Addressed OSH concerns raised by workers as per legal requirements. 1.4 Implemented hazard prevention and control measures as per legal requirement. 1.5 Conducted risk assessment as per legal requirement. 1.6 Developed risk matrix based on likely impact. 1.7 Recognized and established contingency measures in accordance with organization procedures. 1.8 Identified, evaluated and reviewed company OSH program based on legal requirements. 1.9 Implemented company OSH programs as per legal requirements. 1.10 apacity built workers on OSH standards and procedures as per legal requirements 1.11 aintained OSH-related records as per legal requirements.
2. Resource Implications	The following resources should be provided: 2.3 Access to relevant workplace where assessment can take place 2.4 Appropriately simulated environment where assessment can take place
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report
4. Context of Assessment	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

COMMON UNITS OF COMPETENCY

PREPARE AND INTERPRET TECHNICAL DRAWINGS

UNIT CODE: ENG/OS/TEX/CC/01/6/A

Unit description

This unit covers the competencies required to prepare and interpret technical drawings. It involves competencies to select, use and maintain drawing equipment and materials. It also involves producing plain geometry drawings, solid geometry drawings, pictorial and orthographic drawings of components and application of CAD packages.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes that make up workplace function.	**PERFORMANCE CRITERIA** These assessable statements specify the required level of performance for each of the elements. ***(Bold and italicized terms are elaborated in the Range)***
1. Use and maintain drawing equipment and materials	1.1 ***Drawing equipment*** are identified and gathered according to task requirements 1.2 ***Drawing materials*** are identified and gathered according to task requirements 1.3 Drawing equipment are used and maintained as per manufacturer's instructions 1.4 Drawing materials are used as per workplace procedures 1.5 Waste materials are disposed in accordance with workplace procedures and ***environmental legislations*** 1.6 ***Personal Protective Equipment*** is used according to occupational safety and health regulations

ELEMENT These describe the key outcomes that make up workplace function.	PERFORMANCE CRITERIA These assessable statements specify the required level of performance for each of the elements. ***(Bold and italicized terms are elaborated in the Range)***
2. Produce plain geometry drawings	2.1 Different types of lines used in drawing and their meanings are identified according to standard drawing conventions 2.2 Different types of ***geometric forms*** are constructed according to standard drawing conventions 2.3 Different types of angles are constructed according to principles of trigonometry 2.4 Different types of angles are measured using appropriate measuring tools 2.5 Angles are bisected according to standard drawing conventions 2.6 Sketches and drawings of patterns are interpreted according to standard conventions 2.7 Patterns are developed in accordance with standard conventions
3. Produce pictorial and orthographic drawings of components	3.1 Different symbols and abbreviations are identified and their meaning interpreted according to standard drawing conventions 3.2 Isometric sketches and drawings of components are interpreted and produced in accordance with the standard conventions of isometric drawings 3.3 First and third angle orthographic sketches and drawings of components are interpreted and produced in accordance with the standard conventions of orthographic drawings 3.4 Freehand sketching of different types of geometric forms, tools, equipment, diagrams and components is conducted
4. Produce assembly drawings	4.1 Orthographic views are exploded according to standard conventions of orthographic drawings. 4.2 Pictorial views are exploded according to standard conventions of orthographic drawings. 4.3 Part lists are identified according to part to be produced 4.4 Sectional views are produced according to standard conventions of drawing. 4.5 Produced drawing is hatched according to standard conventions of drawings.

ELEMENT These describe the key outcomes that make up workplace function.	PERFORMANCE CRITERIA These assessable statements specify the required level of performance for each of the elements. ***(Bold and italicized terms are elaborated in the Range)***
5. Apply CAD packages in drawing	5.1 CAD packages are selected according to task requirements 5.2 CAD packages are applied in production of plant machine parts.

RANGE

Variable	Range
1. Drawing equipment may include but is not limited to:	• Drawing boards • T-square • Set squares • Drawing set • Computers with CAD packages
2. Drawing materials may include but is not limited to:	• Drawing papers • Pencils • Erasers • Masking tapes • Paper clips
3. Environmental legislations may include but is not limited to:	• EMCA 1999
4. Personal Protective Equipment may include but is not limited to:	• Dust coats • Closed leather shoes • Goggles for CAD
5. Geometric forms may include but is not limited to:	• Circles • Triangles • Rectangles • Parallelogram • Polygons • Pyramids • Conic sections • Prisms • Loci

6. Standard drawing conventions may include but is not limited to:	• Anatomy of engineering drawing (title block, coordinate grid system, revision block, notes and legends) • Drawing scale (paper size and drawing symbols) • International drawing standards

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
- Drawing
- Interpretation
- Drawing equipment handling
- Analysis and synthesis
- Communication
- Inter personal

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 Applied and adhered to safety procedures 1.2 Cared and maintained drawing equipment 1.3 Interpreted technical diagrams 1.4 Applied appropriate technical standards, used proper tools and equipment for a given task 1.5 Produced sketches and drawings 1.6 Applied CAD packages in production of drawings

2. Resource Implications	Resources the same as that of workplace are advised to be applied. 2.1 Drawing room 2.2 Drawing equipment and materials 2.3 Computers 2.4 CAD packages 2.5 PPE
3. Methods of Assessment	Competency may be assessed through: 3.1 Practical tests 3.2 Observation 3.3 Written tests
4. Context of Assessment	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

APPLY ENGINEERING MATHEMATICS

UNIT CODE: ENG/OS/TEX/CC/02/6/A

Unit description

This unit describes the competencies required by a technician in order to apply engineering mathematics. It involves competencies required to apply algebra, trigonometry and hyperbolic functions, complex numbers, coordinate geometry, carry out binomial expansion, calculus, solve ordinary differential equations, carry out mensuration, apply power series, statistics, numerical methods, vector theory and matrix.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function.	**PERFORMANCE CRITERIA** These assessable statements specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range.***
1. Apply Algebra	1.1 Calculations involving Indices are performed as per the concept 1.2 Calculations involving Logarithms are performed as per the concept 1.3 Scientific calculator is used in solving mathematical problems in line with manufacturer's manual 1.4 Simultaneous equations are performed as per the rules 1.5 Quadratic equations are calculated as per the concept 1.6 Permutations and combinations are performed
2. Apply Trigonometry and hyperbolic functions	2.1 Calculations are performed using trigonometric rules 2.2 Calculations are performed using hyperbolic functions
3. Apply complex numbers	3.1 Complex numbers are represented using Argand diagrams 3.2 Operations involving complex numbers are performed

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These assessable statements specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range.***
	3.3 Calculations involving complex numbers are performed using De Moivre's theorem
4. Apply Coordinate Geometry	4.1 Polar equations are calculated using coordinate geometry 4.2 Graphs of given polar equations are drawn using the Cartesian plane 4.3 Normal and tangents are determined using coordinate geometry
5. Carry out Binomial Expansion	5.1 Roots of numbers are determined using binomial theorem 5.2 Errors of small changes are determined using binomial theorem
6. Apply Calculus	6.1 Derivatives of functions are determined using Differentiation 6.2 Derivatives of hyperbolic functions are determined using Differentiation 6.3 Derivatives of inverse trigonometric functions are determined using Differentiation 6.4 Rate of change and small change are determined using Differentiation. 6.5 Calculation involving stationery points of functions of two variables are performed using differentiation. 6.6 Integrals of algebraic functions are determined using integration 6.7 Integrals of trigonometric functions are determined using integration 6.8 Integrals of logarithmic functions are determined using integration 6.9 Integrals of hyperbolic and inverse functions are determined using integration
7. Solve Ordinary differential equations	7.1 First order and second order differential equations are solved using the method of undetermined coefficients 7.2 First order and second order differential equations are solved from given boundary conditions

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These assessable statements specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range.***
8. Carry out Mensuration	8.1 Perimeter and areas of figures are obtained 8.2 Volume and Surface area of solids are obtained 8.3 Area of irregular figures are obtained 8.4 Areas and volumes are obtained using Pappus theorem
9. Apply Power Series	a. Power series are obtained using Taylor's Theorem b. Power series are obtained using McLaurin's 's theorem
10. Apply Statistics	10.1Mean, median, mode and Standard deviation are obtained from given data 10.2Calculations are performed based on Laws of probability 10.3Calculation involving ***probability distributions,*** mathematical expectation sampling distributions are performed 10.4Sampling distribution methods are applied in data analysis 10.5Calculations involving use of standard normal table, sampling distribution, T-distribution and Estimation are done 10.6Confidence intervals are determined
11. Apply Numerical methods	8.1 Roots of polynomials are obtained using iterative ***numerical methods*** 8.2 Interpolation and extrapolation is performed using numerical methods
12. Apply Vector theory	12.1Vectors and scalar quantities are obtained in two and three dimensions 12.2***Operations*** on vectors are performed 12.3Position of vectors is obtained 12.4Resolution of vectors is done

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These assessable statements specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range.***
13. Apply Matrix	13.1Determinant and inverse of 3x3 matrix are obtained 13.2Solutions of simultaneous equations are obtained 13.3Calculation involving Eigen values and Eigen vectors are performed

RANGE

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

Variable	Range
1. Operations may include but is not limited to:	• Addition • Subtraction
2. Hyperbolic functions may include but is not limited to:	• Sinh x • Cosh x • Cosec x • Coth x • Tanh x • Sech x
3. Probability Distributions may include but is not limited to:	• Binomial • Poisson • Normal
4. Numerical Methods may include but is not limited to:	• Newton Raphson • Gregory Newton

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 and applying mathematical formulas
- Logical thinking

- Problem solving
- Applying statistics
- Drawing graphs
- Using different measuring tools

Required knowledge

The individual needs to demonstrate knowledge of:

- Fundamental operations (addition, subtraction, division, multiplication)
- Calculating area and volume
- Types and purpose of measuring instruments
- Units of measurement and abbreviations
- Rounding techniques
- Types of fractions
- Types of tables and graphs
- Presentation of data in tables and graphs
- Vector operations
- Matrix operations

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 Applied Trigonometry and hyperbolic functions 1.2 Applied complex numbers 1.3 Applied Calculus 1.4 Solved Ordinary differential equations 1.5 Carried out mensuration 1.6 Applied Power Series 1.7 Applied vectors 1.8 Applied numerical methods 1.9 Applied statistics
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Measuring equipment 2.3 Materials relevant to the proposed activity or tasks
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Direct Observation 3.2 Demonstration with Oral Questioning 3.3 Written tests

4. Context of Assessment	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

APPLY MECHANICAL SCIENCE PRINCIPLES

UNIT CODE: ENG/OS/TEX/CC/03/6/A

Unit description

This unit describes the competencies required by a textile technician to apply mechanical science principles in their work. It includes determining forces in a system, demonstrating knowledge of moments, understanding friction principles, understanding motions in engineering, describing work, energy and power, performing machine calculations, demonstrating gas principles, applying heat knowledge, applying density knowledge and applying pressure principles.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function.	**PERFORMANCE CRITERIA** These assessable statements specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range.***
1. Determine forces in a system	1.1 Forces are defined and described 1.2 ***Forces theorems*** are described 1.3 Resultant of coplanar forces are determined.
2. Demonstrate knowledge of moments	2.1 Moments are defined 2.2 Moments are calculated 2.3 Principles of moments are described 2.4 Couples are identified and applied in engineering systems.
3. Understand friction principles	3.1 Laws of friction are identified 3.2 Limiting friction is calculated 3.3 Forces applied at an angle to a horizontal plane are calculated 3.4 Coefficient of friction is calculated 3.5 Advantages and disadvantages of friction are identified.
4. Understand motions in engineering	4.1 Motion concepts are discussed 4.2 Laws of motion are identified 4.3 Motion calculations are performed 4.4 Displacement/time graphs are applied
5. Describe work, energy and power	5.1 Work is calculated 5.2 Energy is calculated 5.3 Power calculations are performed
6. Perform machine calculations	6.1 ***Problems on simple machines*** are solved 6.2 Problems on levers are solved

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These assessable statements specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range.***
	6.3 Laws of machines are identified
7. Demonstrate gas principles	7.1 ***Gas laws*** are identified 7.2 Gas laws are applied in solving engineering problems 7.3 Uses of gases in engineering systems are identified
8. Apply heat knowledge	8.1 Heat concepts are discussed 8.2 Working principle of heat is defined 8.3 Heat capacity is discussed 8.4 Heat problems are solved
9. Apply density knowledge	9.1 ***Density terminology*** are discussed 9.2 Density measurements are carried out 9.3 Density problems are solved
10. Apply pressure principles	10.1 Pressure concepts are discussed 10.2 Working principles of pressure is discussed 10.3 Pressure problems are solved 10.4 ***Pressure applications*** are identified

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
Forces theorems may include but is not limited to:	• Parallelogram • Triangle • Polygon
Problems on simple machines may include but is not limited to:	• Machine advantage • Velocity ratio • Efficiency
Gas laws may include but is not limited to:	• Boyles law • Charles law • Gas equation
Density terminology may include but is not limited to:	• Density • Relative density

Pressure applications may include but is not limited to:	• Vacuum pump • Hydraulic pump • Hydrometers
Principles may include but is not limited to:	• Newton's laws of motion • Law of conservation of linear momentum • Law of conservation of energy • Archimedes' principle
Mechanical calculations may include but is not limited to:	• Mechanical advantage • Efficiency • Torque • Power/Energy • Work done
Laws of fluids may include but is not limited to:	• Pascal's principle • Gas laws

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:

- Apply basic mechanical formulas
- Use of basic mechanical machines
- Perform various unit conversions of mechanical quantities
- Basic mechanical systems design
- Mechanical machine operation
- Logical thinking
- Problem solving
- Applying statistics
- Drawing graphs
- Using different measuring tools

Required knowledge

The individual needs to demonstrate knowledge of:

- Newton's law
- Levers
- Gear trains
- Laws of conservation of energy
- Laws of friction
- Type of forces
- Thermodynamics

- Calculation of fluid pressure and flow rate
- Mechanical advantage and efficiency calculations
- Properties of materials
- Gas laws
- SI units of mechanical energy.
- Power transmission systems
- Parameters of fluid system
- Operation of mechanical machines
- Mechanical calculation of power, energy, work done, torque and safety factor
- Units of measurement, conversions and abbreviations

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 Determined forces in a system 1.2 Demonstrated knowledge of moments 1.3 Understood friction principles 1.4 Understood motions in engineering 1.5 Described work, energy and power 1.6 Performed machine calculations 1.7 Demonstrated gas principles 1.8 Applied heat knowledge 1.9 Applied density knowledge 1.10 Applied pressure principles
2 Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Measuring tools and equipment 2.3 Sample materials to be tested
3 Methods of Assessment	Competency in this unit may be assessed through: 3.1 Direct Observation 3.2 Demonstration with Oral Questioning 3.3 Case studies 3.4 Written tests
4 Context of Assessment	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment

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

APPLY FLUID MECHANICS PRINCIPLES

UNIT CODE: ENG/OS/TEX/CC/04/6/A

Unit description

This unit describes the competencies required by a textile technician in order to apply a wide range of fluid mechanics principles in their work. It includes understanding flow of fluids, demonstrating knowledge in viscous flow, performing dimensional analysis and operating fluid pumps

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes that make up workplace function.	**PERFORMANCE CRITERIA** These assessable statements specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range.***
1. Understand flow of fluids	1.1 Flow rate in pipes is measured according to work requirements 1.2 Losses in pipes are determined according to work requirements 1.3 ***Causes of losses*** in pipes are determined according to work requirements 1.4 Flow losses equations are applied in problem solving according to prescribed fluid principles
2. Demonstrate knowledge in viscous flow	2.1 Viscous flow between parallel surfaces are explained according to prescribed fluid principles 2.2 Viscous flow equations between parallel surfaces are derived and applied according to prescribed fluid principles 2.3 Viscous flow equations in circular pipes are derived and applied in problem solving according to prescribed fluid principles
3. Perform dimensional analysis	3.1 Dimensional analysis is explained according to prescribed fluid principles 3.2 Principle of dimensional homogeneity is explained according to prescribed fluid principles 3.3 Fundamental dimensions are stated according to prescribed fluid principles 3.4 Dimensional units are defined according to prescribed fluid principles 3.5 ***Physical quantities*** are identified according to prescribed fluid principles

ELEMENT These describe the key outcomes that make up workplace function.	PERFORMANCE CRITERIA These assessable statements specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range.***
	3.6 Dimensional analysis is applied in problem solving according to prescribed fluid principles
4. Operate fluid pumps	4.1 ***Principle of operation*** of pumps is described according to prescribed fluid principles 4.2 Reciprocating pump equation is derivedaccording to prescribed fluid principles 4.3 Centrifugal pump equation is derivedaccording to prescribed fluid principles 4.4 Pump equations are applied in problem solving according to prescribed fluid principles

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
Causes of losses may include but is not limited to:	• Friction • Enlargement/reduction in cross-sectional areas
Physical quantities may include but is not limited to:	• Mass • Force • Density • Velocity • Acceleration
Principle of operation may include but is not limited to:	• Reciprocating • Centrifugal

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:

- Apply basic mechanical formulas
- Use of basic mechanical machines
- Perform various unit conversions of mechanical quantities
- Basic mechanical systems design

- Mechanical machine operation
- Logical thinking
- Problem solving
- Applying statistics
- Drawing graphs
- Using different measuring tools

Required knowledge

The individual needs to demonstrate knowledge of:

- Newton's law
- Levers
- Gear trains
- Laws of conservation of energy
- Laws of friction
- Type of forces
- Thermodynamics
- Calculation of fluid pressure and flow rate
- Mechanical advantage and efficiency calculations
- Gas laws
- SI units of mechanical energy.
- Power transmission systems
- Parameters of fluid system
- Operation of mechanical machines
- Mechanical calculation of power, energy, work done, torque and safety factor
- Units of measurement, conversions and abbreviations

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 Identified Principles of mechanical science 1.2 Performed mechanical calculations of a system 1.3 Identified types of forces on a system 1.4 Calculated resultant forces on plane framework 1.5 Identified application of forces on the production flow 1.6 Tested mechanical properties of a materials 1.7 Identified tools and equipment for measuring system parameters 1.8 Recorded and interpreted measured parameters. 1.9 Operated Power transmission systems

2 Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Measuring tools and equipment 2.3 Sample materials to be tested
3 Methods of Assessment	Competency in this unit may be assessed through: 3.1 Direct Observation 3.2 Demonstration with Oral Questioning 3.3 Case studies 3.4 Written tests
Context of Assessment	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

APPLY MATERIAL SCIENCE PRINCIPLES

UNIT CODE: ENG/OS/TEX/CC/05/6/A

Unit Description

The learner will be introduced to performing material testing and metallurgical processes. It involves analyzing properties of engineering materials, performing extraction processes, producing iron materials, ceramics, composites and alloys, performing heat treatment, material testing and identifying corrosion and its prevention

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicized terms are elaborated in the Range)***
1. Analyze properties of engineering materials	1.1 Type of engineering materials is identified as per the procedures 1.2 ***Physical properties*** of engineering material are determined 1.3 ***Mechanical properties*** of engineering materials are tested 1.4 Crystal structure of materials is analyzed
2. Perform ore extraction processes	2.1 Safety procedures are observed according OSHA 2.2 Method of extraction is determined as per material properties and its composition 2.3 Procedure in extraction process is determined as per extraction method 2.4 Extraction by- products are stored as per SOPs 2.5 Extraction by- products are disposed as per SOPs
3. Produce iron materials	3.1 Perform ore smelting according to standard operating procedures. 3.2 ***Composition of iron***is determined 3.3 Method of producing ***iron material*** is established 3.4 Refinement processes are identified based on iron material required
4. Produce alloy materials	4.1 Materials in alloy formation are identified 4.2 Alloy formation process is identified based on alloy to be produced 4.3 Alloy tested based on alloy production requirement

5. Produce non-ferrous materials	5.1 ***Non-ferrous materials*** are extracted according to SOP 5.2 Extracted non-ferrous material is smelted and purified as per the SOP 5.3 Non-ferrous material is tested according to SOP 5.4 Alloying elements for non-ferrous materials are identified 5.5 Alloy formation process is identified based on alloy to be produced 5.6 Alloys for non-ferrous material are tested based on production requirement
6. Produce ceramics materials	6.1 Composition of ***ceramic materials*** is identified 6.2 Manufacturing process is identified 6.3 Ceramic materials are produced according to manufacturing processes 6.4 ***Finishing processes*** are identified
7. Produce composite materials	7.1 Type of composite to be produced is identified 7.2 Elements involve in composite formation are identified 7.3 Formation process of composite to be produced is identified 7.4 Composite is tested as per composite production requirement
8. Utilise ***other engineering materials***	8.1 Identify and select engineering material according to production requirements. 8.2 Operation plan is developed according to engineering drawing. 8.3 Appropriate machine is set up according to manufacturer's manual 8.4 Production parameters are set according to production requirement 8.5 Production is performed
9. Perform heat treatment	*9.1* Safety practices are observed according to OSHA 2007 9.2 ***Heat treatment processes*** are identified 9.3 Procedure in heat treatment processes 9.4 Heat treatment of metals are performed

10. Perform material testing	10.1 Safety is observed in material testing procedures 10.2 ***Material testing methods*** are identified depending on material to be tested 10.3 Procedure of material testing is followed as per material testing method 10.4 Material testing results are tabulated, calculated and interpreted 10.5 Material testing equipment are taken care of and maintained.
11. Prevent material corrosion	11.1 Safety is observed during corrosion prevention 11.2 ***Corrosion type*** is identified 11.3 Corrosive atmosphere is identified 11.4 ***Methods of corrosion prevention*** are identified 11.5 Corrosion is prevented

RANGE

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

VARIABLE	**RANGE**
1. Mechanical properties may include but is not limited to:	• Ductility • Malleability • Elasticity • Toughness • Hardness • Brittleness • Plasticity • Strength
2. Physical properties may include but is not limited to:	• Density • Colour • Texture • Melting point • Thermo conductivity • Electrical resistivity
3. Composition of iron may include but is not limited to:	• Iron (II) oxide • Iron (III) oxide
4. Iron materials may include	• Cast iron • Steel

VARIABLE	RANGE
1. Mechanical properties may include but is not limited to:	• Ductility • Malleability • Elasticity • Toughness • Hardness • Brittleness • Plasticity • Strength
2. Physical properties may include but is not limited to:	• Density • Colour • Texture • Melting point • Thermo conductivity • Electrical resistivity
5. Ceramic materials but is not limited to:	• Oxides • Nitrides • Carbides • Silica
6. Finishing processes may include but is not limited to:	• Lapping • Fine grinding • Polishing
7. Corrosion type may include but is not limited to:	• Galvanic • Stress corrosion cracking
8. Methods of corrosion prevention may include but is not limited to:	• Painting • Electroplating • Galvinizing • Cathodic • Chromizing

REQUIRED KNOWLEDGE AND SKILLS

The individual needs to demonstrate the following skills

Required Skills

- Measuring and marking
- Material testing
- Use of hand tools

- Inspection and testing

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
- Equipment manuals
- Mathematics & science
- Physics and mechanics
- Metallurgy and materials
- Inspection and testing
- WIBA ACT
- Report writing

EVIDENCE GUIDE

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

1. Critical Aspects of Competency	Assessment requires evidence that the learner 1.1 Observed safety as per work place procedures 1.2 Demonstrated understanding of physical, chemical and mechanical properties of engineering materials 1.3 Performed extraction processes 1.4 Produced iron materials 1.5 Produced ceramics 1.6 Produced composites 1.7 Produced alloys 1.8 Performed heat treatment 1.9 Performed material testing 1.10 Demonstrated understanding of corrosion types and its prevention
2. Resource Implications	The following resources should be provided: 2.1 Testing materials 2.2 Extraction materials 2.3 Measuring instruments 2.4 Inspection tools

3. Methods of Assessment	Competency may be accessed through: 3.1 The behaviour of the learner in the working environment 3.2 Inpection of finished product 3.3 Process analysis
4. Context of Assessment	ompetency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment	Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended.

CORE UNITS OF COMPETENCY

PERFORM TEXTILE TESTING

UNIT CODE: ENG/OS/TEX/CR/01/6/A

Unit description

This unit describes the competencies required by a Textile technician to perform textile testing. It involves competencies required to test textile fibre, textile yarn, inspect grey fabric properties, test processed fabric and inspect finished fabric.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicized terms are elaborated in the Range)***
1. Perform textile fibre testing	1.1 Test environment is conditioned according to specified standard. 1.2 ***Fibre test*** is identified according to job specification. 1.3 Fibre testing standards are obtained according to organisational procedures. 1.4 ***Fibre testing equipment*** are selected and set up according test specification. 1.5 Fibre samples are obtained according to test specification. 1.6 Fibre samples are conditioned according to test specification. 1.7 Prescribed test is carried out according to job specification. 1.8 Test results are recorded according to standard operating procedure (SOP).
2. Perform textile yarn testing	2.1 Test environment is conditioned according to specified standard. 2.2 ***Textile yarn test*** is identified according to job specification. 2.3 Textile ***yarn testing equipment*** are selected and set up according test specification. 2.4 Textile ***yarn samples*** are obtained according to test specification. 2.5 Textile yarn samples are conditioned according to test specification.

	2.6 Prescribed test is carried out according to job specification. 2.7 Test results are recorded according to standard operating procedure (SOP).
3. Inspect grey fabric	3.1 Grey fabric roll is obtained according to organisational procedures. 3.2 Fabric inspection table status is checked according to organisational standards. 3.3 Grey fabric is loaded on inspection table according to SOP. 3.4 Grey fabric is inspected for ***yarn and weaving defects*** according to SOP. 3.5 Detected ***yarn*** and weaving defects are marked according to SOP 3.6 Detected yarn and weaving defects are mended where possible according to SOP. 3.7 Mended grey fabric is graded and recorded according to SOP.
4. Test processed fabric	4.1 Test environment is conditioned according to specified standard. 4.2 Processed fabric test is identified according to job specification. 4.3 Processed fabric testing equipment are selected and set up according test specification. 4.4 Processed fabric samples are obtained according to test specification. 4.5 Processed fabric samples are conditioned according to test specification. 4.6 ***Prescribed test*** is carried out according to job specification. 4.7 Test results are recorded according to standard operating procedure (SOP).
5. Inspect finished fabric	5.1 Finished fabric roll is obtained according to organisational procedures. 5.2 Fabric inspection table status is checked according to organisational standards.

	5.3 Finished fabric is loaded on inspection table according to SOP. 5.4 Finished fabric is inspected for ***process defects*** according to SOP. 5.5 Detected process defects are marked according to SOP 5.6 Detected process defects are mended where possible according to SOP. 5.7 Finished fabric is graded and recorded according to SOP. 5.8 Finished fabric is packed according to organisational standard.

RANGE

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

Variable	**Range**
1. Fibre test may include but not limited to:	• Staple length • Fibre fineness • Fibre maturity • Fibre strength • Trash content
2. Fibre testing equipment may include but not limited to:	• Fibro graphy • Fibre baer sorter • Trash analyzer
3. Fibre samples may include but not limited to:	• Tuft • Fleece • Lap • Sliver • Roving
4. Textile yarn test may include but not limited to:	• Tensile strength • Twist • Neps • Evenness • Count
5. Yarn testing equipment may	• Beam balance • Strength tester • Evenness tester

Variable	Range
include but not limited to:	• Wrap reel
6. Textile yarn samples may include but not limited to:	• Cone • Bobbin • Cheese
7. Yarn and weaving defects may include but not limited to:	• Foreign materials • Missing ends • Missing peaks • Thick and thin places • Stains • Starting marks • Reed marks
8. Prescribed test may include but not limited to:	• Color fastness • Abrasive resistance • Absorbency
9. Process defects may include but not limited to:	• Colour variation • Holes • Stains • Foreign materials

REQUIRED SKILLS

The individual needs to demonstrate skills in:

- Inspection of textile products
- Testing of textile Material
- Control of textile testing equipment
- Correcting process defects
- Sample preparation
- Grading
- Interpreting and following information on written job instructions, manufacturer specifications, standard operating procedures, charts, lists, reports and other applicable reference documents
- Checking and clarifying information
- Planning and sequencing tasks
- Identifying non-compliances
- Communication skills– oral/written
- Data collection

REQUIRED KNOWLEDGE

The individual needs to demonstrate knowledge of:

- Properties of textile raw materials
- Textile testing equipment
- Identification of textile material defects and faults
- Fault rectification techniques
- Applicable textile standards
- Safety practices and procedures
- Sampling techniques
- Documentation
- Procedure for safe disposal of waste materials
- Principle of testing
- Textile processes

EVIDENCE GUIDE

This provides advice on assessment and must be 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 Identified technical specification of textile materials 1.2 Tested textile material 1.3 Identified properties of textiles materials 1.4 Inspected quality of textile materials 1.5 Graded textile materials according to specifications 1.6 Operated textile testing equipment 1.7 Observed safety while performing testing operations
2. Resource Implications.	The following resources should be provided: 2.1 Textile testing equipment 2.2 Textile materials 2.3 Textile reference materials/ standards 2.4 Stationery 2.5 Computer 2.6 Software 2.7 Tools and equipment 2.8 Reagents 2.9 Textile laboratory
3. Methods of Assessment.	***Competency may be assessed through:*** 3.1 Practical 3.2 Observation 3.3 Questionnaire 3.4 Written examinations 3.5 Oral presentation

4. Context of Assessment.	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment.	This unit may be assessed on an integrated basis with others within this occupational sector.

PRODUCE TEXTILE YARN (SPINNING)

UNIT CODE: ENG/OS/TEX/CR/02/6/A

Unit description

This unit describes the competencies required by a textile technician to produce textile yarns. It involves competencies required to produce blow room lap, carded sliver, draw frame sliver, sliver lap, combed sliver, textile roving, ring spun yarn, yarn winding operations, plied yarns, rotor spun yarn, continuous filament yarns and Control yarn production and quality parameters

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicized terms are elaborated in the Range)***
1. Produce blow room lap	1.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 1.2 Blending order instructions are obtained and interpreted 1.3 Fibre bales are obtained according to blending order instruction 1.4 Fibre bales are blended according to blending order instruction 1.5 Blow room line is prepared according to product specification 1.6 ***Blow room machines*** are operated according to work instruction 1.7 Blow room machines are monitored for smooth process flow according to SOP 1.8 Process defects are identified and corrected where possible according to SOP 1.9 Unsolved defects are reported according to workplace procedures 1.10 Blow room lap is doffed and stored according to product specification 1.11 Produced waste is collected according to workplace procedures 1.12 Blow room lap particulars are documented according to organisational standards
2. Produce carded sliver	2.1 Safety precautions are observed according to occupational health and safety standards (OSHA)

	2.2 Carding machine is set up for production according to operating instruction 2.3 ***Carding input*** is obtained and fed into the carding machine according to SOP 2.4 Carding machine is operated according to workplace procedures 2.5 Carding process is monitored for smooth operation according to SOP 2.6 ***Carding process defects*** are identified and corrected where possible according to organisational standards 2.7 Unsolved defects are reported according to workplace procedures 2.8 Carded sliver is delivered according to SOP 2.9 Produced waste is collected according to workplace procedures 2.10 Carded sliver particulars are documented according to organisational standards
3. Produce draw frame sliver	3.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 3.2 Draw frame is set up for production according to operating instruction 3.3 Sliver is obtained and fed into the draw frame according to SOP 3.4 Draw frame is operated according to workplace procedures 3.5 Drawing process is monitored for smooth operation according to SOP 3.6 ***Drawing process defects*** are identified and corrected where possible according to organisational standards 3.7 Unsolved defects are reported according to workplace procedures 3.8 Drawn sliver is delivered according to SOP 3.9 Produced waste is collected according to workplace procedures 3.10 Drawn sliver particulars are documented according to organisational standards
4. Produce sliver lap	4.1 Safety precautions are observed according to occupational health and safety standards (OSHA)

	4.2 ***Lap forming machine*** is set up for production according to operating instruction 4.3 Drawn sliver is obtained and fed into lap forming machine according to SOP 4.4 Lap forming machine is operated according to workplace procedures 4.5 Sliver lap forming process is monitored for smooth operation according to SOP 4.6 ***Sliver lap forming process defects*** are identified and corrected where possible according to organisational standards 4.7 Unsolved defects are reported according to workplace procedures 4.8 Sliver lap produced is delivered according to SOP 4.9 Produced waste is collected according to workplace procedures 4.10 Sliver lap particulars are documented according to organisational standards
5. Produce textile roving	1.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 1.2 Speed frame is set up for production according to operating instruction 1.3 Sliver is obtained and fed into speed frame according to SOP 1.4 Speed frames are operated according to workplace procedures 1.5 Roving process is monitored for smooth operation according to SOP 1.6 Roving process defects are identified and corrected where possible according to organisational standards 1.7 Unsolved defects are reported according to workplace procedures 1.8 Roving produced is delivered according to SOP 1.9 Produced waste is collected according to workplace procedures 1.10 Roving particulars are documented according to organisational standards
6. Produce ring spun yarn	7.1 Safety precautions are observed according to occupational health and safety standards (OSHA)

	7.2 Ring frame is set up for production according to operating instruction 7.3 Roving is obtained and fed into ring frame according to SOP 7.4 Ring frames are operated according to workplace procedures 7.5 Ring spinning process is monitored for smooth operation according to SOP 7.6 ***Ring spinning process defects*** are identified and corrected where possible according to organisational standards 7.7 Unsolved defects are reported according to workplace procedures 7.8 Ring spun yarn produced is delivered according to SOP 7.9 Produced waste is collected according to workplace procedures 7.10 Ring spun yarn particulars are documented according to organisational standards
7. Perform yarn winding operations	8.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 8.2 Winding machines are set up according to product specifications 8.3 Inspected ring cops are loaded on winding machine according to SOP 8.4 ***Winding machines*** are operated according to workplace procedures 8.5 Winding process is monitored for smooth operation according to SOP 8.6 ***Winding process defects*** are identified and corrected where possible according to organisational standards 8.7 Unsolved defects are reported according to workplace procedures 8.8 Full packages produced are delivered according to SOP 8.9 Produced waste is collected according to workplace procedures 8.10 Winding operations are documented according to organisational standards

8. Produce rotor spun yarn	8.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 8.2 Rotor spinning machine is set up for production according to operating instruction 8.3 Sliver is obtained and fed into rotor spinning machine according to SOP 8.4 Rotor spinning machines are operated according to workplace procedures 8.5 Rotor spinning process is monitored for smooth operation according to SOP 8.6 ***Rotor spinning process defects*** are identified and corrected where possible according to organisational standards 8.7 Unsolved defects are reported according to workplace procedures 8.8 Rotor spun yarns produced are delivered according to SOP 8.9 Produced waste is collected according to workplace procedures 8.10 Rotor spun yarn particulars are documented according to organisational standards
9. Produce continuous filament yarns	9.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 9.2 ***Filament producing machines*** are set up for production according to ***product specifications*** 9.3 Polymer chips are obtained and fed into melt extruder machine according to product specifications 9.4 Extruder is operated according to workplace procedures. 9.5 Extruder operations are monitored for smooth process flow according to workplace procedures. 9.6 Continuous filament yarns are doffed according to SOPs 9.7 Extruded filaments are obtained and fed into texturizing machine according to product specifications 9.8 Texturizing machine is operated according to workplace procedures.

	9.9 Texturizing operations are monitored for smooth process flow according to workplace procedures. 9.10 Extrusion and texturizing process defects are identified and corrected where applicable according to SOPs 9.11 Unsolved defects are reported according to workplace procedures 9.12 Texturized filament yarn is doffed off according to SOPs 9.13 Produced waste is collected according to workplace procedures 9.14 Produced filament yarn particulars are documented according to organisational standards
10. Control yarn production and quality parameters	10.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 10.2 Efficient production requirements are identified according to work plan 10.3 Production efficiency is monitored according to SOPs. 10.4 Production process is controlled according to production requirement 10.5 Product in process is inspected according to quality requirement 10.6 Process non-conformance is identified and documented according to workplace requirements.

RANGE

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

Variable	Range
1. Blow room machines may include but is not limited to:	• Bale plucker • Bale open • Beaters • Condensers

Variable	Range
2. Carding input may include but is not limited to:	• Laps • Chute flock
3. Carding process defects may include but is not limited to:	• Patch web • Bulk sliver • High carding waste • High breaks
4. Drawing process defects may include but is not limited to:	• Defective stop motions • Defective auto levellers
5. Lap forming machine may include but is not limited to:	• Sliver lap forming • Ribbon lap forming • Unilap lap forming
6. Sliver lap forming process defects may include but is not limited to:	• Defective stop motions • Bulky sliver • Lap breakages
7. Combing process defects may include but is not limited to:	• Long fibres in wastage • Coiler choke-ups • Roller lappings • Lap licking
8. Ring spinning process defects may include but is not limited to:	• Thick and thin places • Broken end • Roller lapping
9. Winding machines may include but is not limited to:	• Cone winding machine • Cheese winding machine
10. Winding process defects may include but is not limited to:	• Tight winding • Patterning • Hard nose • Soft nose
11. Plied yarn producing machines may include but is not limited to:	• Parallel winding machines • Two-four-one twisting machine

Variable	Range
12. Rotor spinning process defects may include but is not limited to:	• Clogged rotor groves • Ineffective piercing
13. Filament producing machines may include but is not limited to:	• Melt extruder machine • Cold extruder • Yarn texturizing machine

REQUIRED KNOWLEDGE

The individual needs to demonstrate knowledge of:

- Understanding the importance of
  - Types of fibres
  - Types of yarn
  - Yarn count
  - Sliver hank
- Process flow in a spinning mill
- Material flow in a spinning mill
- Working principles
- Functions of different machines in ring spinning department
- Importance of colour coding followed for different counts
- Guidelines for operating the ring spinning machines
- Guidelines for taking charge of shift from previous shift fitter
- Guidelines for handing over the shift to the next shift fitter
- Functions and methodology for operating different material handling tools
- Waste collection system &equipment used
- Importance of cleanliness at workplace
- Work allocation
- Safety procedures to be followed
- Communication

REQUIRED SKILLS

The individual needs to demonstrate skills in:

- Machine operation
- Product inspection
- Measure yarn count
- Convert textile fibres to sliver
- Convert slivers to thread
- Manufacture staple yarns

- Creeling
- Drafting zone
- Top arm settings
- Spacers
- Cots and aprons
- Spindle tapes
- Jockey pulley alignment
- Rings
- Spindle
- Travellers
- Traveller clearer setting
- Pneumatic pipe fitting
- Changing gear wheel
- Variation alignment
- Drafting setting
- Ring centering
- Lappet setting
- Flutter roller eccentricity
- Top arm pressure checking
- Gear end service
- Piston service
- Timing belt checking
- Bobbin holder checking
- Spindle oil checking
- Lubrication

EVIDENCE GUIDE

This provides advice on assessment and must be 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 Produced blow room lap 1.2 Produced card sliver 1.3 Produced draw frame sliver 1.4 Produced sliver lap 1.5 Produced combed sliver 1.6 Produced textile roving 1.7 Produced ring spun yarn 1.8 Performed yarn winding operations 1.9 Produced plied yarns

	1.10 Produced rotor spun yarn 1.11 Produced continuous filament yarns 1.12 Controlled yarn production and quality parameters 1.13 Operated textile spinning machines 1.14 Documented spinning processes
2. Resource Implications.	The following resources should be provided: 2.1 Textile testing equipment 2.2 Spinning machines 2.3 Textile fibres 2.4 Material handling equipment 2.5 Software 2.6 Markers 2.7 Tools and equipment 2.8 Spinning machines (Ring frame, rotor, air jet, extruder, repco) 2.9 Textile raw materials 2.10 Textile products 2.11 Hygrometer 2.12 Thermometer 2.13 Pressure gauge 2.14 Fibro-graph 2.15 Comp sorter 2.16 Doubling machines
3. Methods of Assessment.	***Competency may be assessed through:*** 3.1 Practical tests 3.2 Observation 3.3 Case studies 3.4 Written tests 3.5 Oral questioning
4. Context of Assessment.	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment.	This unit may be assessed on an integrated basis with others within this occupational sector.

PRODUCE WOVEN FABRIC (WEAVING)

UNIT CODE: ENG/OS/TEX/CR/03/6/A

Unit description

This unit describes the competencies required by a textile technician to produce woven fabric. It involves competencies required to produce warp beam, sized beam, and drawn beams, set up weaving machine, operate weaving machines, control production and quality parameters

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicized terms are elaborated in the Range)***
1. Produce warp beam	1.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 1.2 Warping pattern is obtained and interpreted according to design specifications. 2.1 Yarn packages are obtained according to design specifications. 2.2 Yarn packages are loaded to creel according to product specifications 2.3 ***Warping machines are set*** according to machine specifications 2.4 Suitable beam is loaded on warping machine according to product specifications. 2.5 Yarns are withdrawn from warp creel onto empty beam/warping drum according to product specifications. 2.6 ***Warping machine*** is operated according to SOP. 2.7 Production is monitored continuously according to operational instructions 2.8 ***Warping faults*** are identified and corrected according to SOP 2.9 Warped beam is doffed off and stored according to operational instructions. 2.10 Warping operations are documented according to organizational procedures. 2.11 Resources requirements are allocated according to work load
2. Produce sized beam	2.1 Safety precautions are observed according to occupational health and safety standards (OSHA)

	2.2 Warp beams are obtained from warping section according to organizational procedures 2.3 ***Size recipe*** are obtained according to product specifications 2.4 Size liquor is prepared according to job specifications. 2.5 Sizing machines are set according to product specifications. 2.6 Warpers beams are loaded onto the sizing machine according to operational instructions 2.7 Weavers beam is loaded onto the sizing machine according to operational instructions. 2.8 Sizing Machine is operated according to operational procedures 2.9 Sizing process is monitored according to workplace procedures 2.10 ***Sizing*** process ***defects*** are identified and rectified according to SOP 2.11 Sized beams are doffed according to operational procedures. 2.12 Sizing waste is disposed off according to organizational procedures. 2.13 Sizing operations are documented according to organizational procedures. 2.14 Resources requirements are allocated according to work load
3. Produce drawn beams	3.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 3.2 Drawing and denting pattern is obtained and interpreted according to product design. 3.3 Weavers beam is obtained according to product design 3.4 ***Heald frames are prepared*** according to product design 3.5 Reed is prepared according to pattern design 3.6 Warp is drawn and dented according to denting and lifting plan. 3.7 Drawn Weavers beam is stored according to organizational procedures. 3.8 Warping process is documented according to organizational procedures.

4. Set up weaving machine	4.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 4.2 ***Weaving machine*** is identified for new product according to organizational procedure 4.3 Weaving machine is prepared according to organization procedure 4.4 Weavers beam is obtained according to product specifications. 4.5 Weavers beam is mounted onto loom according to manufacturer's manual and product design. 4.6 ***Loom is set*** according to product design.
5. Operate weaving machines	5.1 Machine safety and operation procedures are observed according to manufacturer manuals and OSHA 5.2 Loom is operated to produce to fabric according to operational procedures. 5.3 Weaving process is monitored according to SOP. 5.4 ***Weaving and mechanical faults*** are identified and rectified where possible according to SOP 5.5 Major faults are reported according to SOP 5.6 Grey Fabric rolls are doffed according to SOP. 5.7 Grey fabric rolls are stored according to organizational procedures. 5.8 Weaving operations are documented according to organizational procedures
6. Control weaving production and quality parameters	6.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 6.2 Resources requirements are allocated according to work load 6.3 ***Quality parameters*** are controlled according to product specifications. 6.4 Product in process is inspected according to quality requirement 6.5 Production process is controlled according to production requirement 6.6 Efficient production requirements are identified according to work plan. 6.7 Process non-conformance is identified and documented according to workplace requirements

RANGE

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

Variable	Range
1. Warping machines are set may include but is not limited to:	• Warp length • Beam width • Warp pattern
2. Warping machine may include but is not limited to:	• Sectional • Direct
3. Warping faults may include but is not limited to:	• Broken ends • Crossed ends
4. Size recipe may include but is not limited to:	• Ingredients • Cooking temperature • Cooking time • Mixing method
5. Sizing process defects may include but is not limited to:	• Improper splitting • Under drying of sized warp • Over drying of sized warp • Lapping ends • Migrating ends • Non-uniform beam density
6. Heald frames are prepared may include but is not limited to:	• Number of heald frames • Number of heald wires per frame • Type of frame
7. Weaving machine may include but is not limited to:	• Projectile • Shuttle • Rappier • Air jet • Water jet
8. Loom is set may include but is not limited to:	• Knotting • Lifting pattern • Weft pattern

Variable	Range
9. Quality parameters may include but is not limited to:	• Weaving pattern • Fabric dimensions • Stains • Marks • Foreign material
10. Weaving and mechanical faults may include but is not limited to:	• Missing ends • Starting marks • Shuttle Smash • Irregular salvages • Tight picks • Slack ends • Wrong yarns • Oil stains

REQUIRED SKILLS

The individual needs to demonstrate skills in:

- Weaving machine operation
- Size preparation
- Warping
- Drawing in
- Beam gaiting
- Beam knotting
- Weaving defects mending
- Interpreting and following information on written job instructions, standard operating procedures, lists, reports and other applicable reference documents
- Checking and clarifying information
- Planning and sequencing tasks
- Identifying non-compliances
- Checking for conformance to specifications
- Communication skills
- Problem solving
- Creativity and innovation
- Data collection and analysis
- Use of tools and equipment
- Technical presentation

REQUIRED KNOWLEDGE

The individual needs to demonstrate knowledge of:

- Properties of textile raw materials
- Weaving patterns
- Weaving machines
- Weaving machines operating principles
- Sizing process
- Warping process
- Drawing and denting techniques
- Sizing ingredients
- Quality control parameters
- Identification of woven fabric defects and faults
- Use and application of personal protective equipment
- housekeeping
- Safety practices and procedures
- Use of tools and equipment
- Material handling
- Problem solving
- Documentation
- Testing and inspection
- Procedure for safe disposal of waste materials

EVIDENCE GUIDE

This provides advice on assessment and must be 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 Performed yarn warping 1.2 Performed yarn sizing operations 1.3 Designed weaving pattern 1.4 Performed yarn drawing-in and denting operations 1.5 Performed looming operations 1.6 Operated weaving machines 1.7 Controlled production and quality parameters
2. Resource Implications.	The following resources should be provided: 2.1 Winding machines 2.2 Warping machines 2.3 Sizing machines 2.4 Loom

	2.5 Weaving patterns 2.6 Sizing materials
3. Methods of Assessment.	***Competency may be assessed through:*** 3.1 Practical 3.2 Observation 3.3 Questionnaire 3.4 Case studies 3.5 Written examinations 3.6 Oral presentation
4. Context of Assessment.	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment.	This unit may be assessed on an integrated basis with others within this occupational sector.

PRODUCE KNITTED FABRIC

UNIT CODE: ENG/OS/TEX/CR/04/6/A

Unit description

This unit describes the competencies required by a textile technician to produce knitted fabrics. It involves competencies required to produce warp beam, set up knitting machine, operate knitting machines and control knitting production and quality parameters.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicized terms are elaborated in the Range)***
1. Produce warp beam	1.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 1.2 Warping pattern is obtained and interpreted according to design specifications. 1.3 Yarn packages are obtained according to design specifications. 1.4 Yarn packages are loaded to creel according to product specifications 1.5 Warping machines are set according to machine specifications 1.6 Suitable beam is loaded on warping machine according to product specifications. 1.7 Yarns are withdrawn from warp creel onto empty beam/warping drum according to product specifications. 1.8 Warping machine is operated according to SOP. 1.9 Production is monitored continuously according to operational instructions 1.10 Warping faults are identified and corrected according to SOP 1.11 Warped beam is doffed off and stored according to operational instructions. 1.12 Warping operations are documented according to organizational procedures. 1.13 Resources requirements are allocated according to work load

2. Set up knitting machine	2.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 2.2 Knitting pattern specification is obtained and interpreted 2.3 Knitting machine is identified according to organizational procedure 2.4 Feed material is identified and loaded onto knitting machine according to product specification 2.5 Yarns are passed through guides and tensioners according to pattern specification 2.6 Knitting machine setting points are identified according to pattern specification 2.7 Knitting machine is set according to pattern specification
3. Operate knitting machines	3.1 Machine safety and operation procedures are observed according to manufacturer manuals and OSHA 3.2 Knitting machine is operated to workplace procedure 3.3 Knitting process is monitored according to SOP. 3.4 ***Knitting faults*** are identified and rectified where possible according to SOP 3.5 Major faults are reported according to SOP 3.6 Grey knitted fabric rolls are doffed according to SOP. 3.7 Grey knitted fabric rolls are stored according to organizational procedures. 3.8 Knitting waste is disposed according to organisational procedure 3.9 Knitting operations are documented according to organizational procedures
4. Control knitting production and quality parameters	4.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 4.2 Resources requirements are allocated according to work load 4.3 ***Quality parameters*** are controlled according to product specifications. 4.4 Product in process is inspected according to quality requirement 4.5 Production process is controlled according to production requirement

	4.6 Efficient production requirements are identified according to work plan 4.7 Process non-conformance is identified and documented according to workplace requirements

RANGE

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

Variable	Range
1. Feed material may include but not limited to:	• Cone • Warp beam
2. Knitting machine is set may include but not limited to:	• Yarn tension • GSM • Needle positioning • Cams
3. Knitting faults may include but not limited to:	• Dropped loops • Dropped stitch • Press off stitches • Foreign materials • Stains • Loop marks
4. Quality parameters may include but not limited to:	• Tension • Speed • Pressure • Temperature • Humidity

REQUIRED SKILLS

The individual needs to demonstrate skills in:

- Knitting machine operations
- Threading
- Interpreting and following information on written job instructions, manufacturer specifications, standard operating procedures, reports and other applicable reference documents

- Communication – oral/written
- Identifying non-compliances
- Completing standard workplace forms, workplace reports and other applicable documents
- Checking for conformance to specifications
- Problem solving
- Creativity and innovation

REQUIRED KNOWLEDGE

The individual needs to demonstrate knowledge of:

- Properties of textile raw materials
- Knitting pattern
- Knitting principle
- Types of needles
- Knitting machines
- Quality control parameters
- Identification of knitted textile material defects and faults
- Safety practices and procedures
- Material handling
- Procedure for safe disposal of waste materials

EVIDENCE GUIDE

This provides advice on assessment and must be 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 Performed yarn warping 1.2 Interpreted knitting pattern 1.3 Performed knitting operations 1.4 Operated knitting machines 1.5 Controlled production and quality parameters
2. Resource Implications.	The following resources should be provided: 2.1 Winding machines 2.2 Warping machines 2.3 Knitting patterns 2.4 Testing equipment 2.5 Knitted materials

3. Methods of Assessment.	***Competency may be assessed through:*** 3.1 Practical 3.2 Observation 3.3 Questionnaire 3.4 Case studies 3.5 Written examinations 3.6 Oral presentation
4. Context of Assessment.	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment.	This unit may be assessed on an integrated basis with others within this occupational sector.

PRODUCE NONWOVEN FABRIC

UNIT CODE: ENG/OS/TEX/CR/05/6/A

Unit description

This unit describes the competencies required by a textile technician to produce nonwoven fabric. It involves competencies required to produce laid fiber webs, produce bonded nonwoven fabrics, control production and quality parameters and producing finished nonwoven fabrics.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These are assessable statements which specify the required level of performance for each of the elements	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicized terms are elaborated in the Range)***
1. Produce laid fiber webs	1.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 1.2 Blending order instructions are obtained and interpreted 1.3 ***Nonwoven textile raw materials*** are obtained according to design specifications 1.4 Nonwoven textile raw materials are opened and cleaned according to product specifications 1.5 Fibre bales are blended according to blending order instruction 1.6 Fibre laying machines are operated according to work instruction 1.7 laying machines are monitored for smooth process flow according to applicable ***laying method*** 1.8 Process defects are identified and corrected where possible according to SOP 1.9 Laid web is transferred to the next process according to product specification 1.10 Produced waste is collected according to workplace procedures 1.11 Laying records are documented according to organisational standards
2. Produce bonded nonwoven fabrics	2.1 Safety precautions are observed according to occupational health and safety standards (OSHA)

	2.2 ***Nonwoven method of fabric formation*** is identified according to product design 2.3 Laid webs of fibres are obtained according to design specifications. 2.4 Bonding machines are set according to ***bonding method*** 2.5 Laid web is received onto the bonding machine according to operational instructions. 2.6 bonding Machine is operated according to operational procedures 2.7 bonding process is monitored according to workplace procedures 2.8 ***Bonding process defects*** are identified and rectified according to SOP 2.9 Nonwoven fabric are handled and stored under appropriate conditions according to organization procedures. 2.10 Bonding waste is disposed off according to organizational procedures. 2.11 Bonding operations are documented according to organizational procedures.
3. Control production and quality parameters	3.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 3.2 Resources requirements are allocated according to work load 3.3 ***Product in process*** is inspected according to quality requirement 3.4 Production output is controlled according to the plan 3.5 Efficient production requirements are identified according to work plan 3.6 Process non-conformance is identified and documented according to workplace requirements 3.7 Activities in the production flow are coordinated for continuous and efficient flow of materials.
4. Produce finished nonwoven fabrics	4.1 Safety precautions are observed according to occupational health and safety standards (OSHA) 4.2 ***Finishing methods*** are identified according to the product design 4.3 Non-woven fabric finishing machines are identified according to process layout

	4.4 Machine status is checked and required routine maintenance is undertaken according to manufacturer's manual. 4.5 ***Finishing Quality parameters*** are inspected and controlled according to quality requirements 4.6 Finishing process is controlled according to production requirements 4.7 Non-woven finishing process records are maintained according to organizational procedures.

RANGE

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

Variable	Range
1. Nonwoven textile raw materials may include but is not limited to:	• Fibres • Dyes pigments • Resins and binders
2. Laying method may include but is not limited to:	• Wet-laid • Dry-laid • Extruded • Air
3. Nonwoven method of fabric formation may include but is not limited to:	• Chemical/ adhesive • Mechanical • Thermal
4. Bonding method may include but is not limited to:	• Needle punching • Chemical adhesive binding • Heat application

Variable	Range
5. Quality parameters may include but is not limited to:	• Density • Tensile strength • Bursting strength • Abrasion • Colour fastness • Flame resistance
6. Finishing methods may include but is not limited to:	• Shrinkage • Calendaring • Perforation and slitting • Washing • Dyeing • Printing • Chemical finishing • Coating • Lamination • Flocking

REQUIRED SKILLS

The individual needs to demonstrate skills in:

- Communication skills
- Problem solving
- Creativity and innovation
- Data collection and analysis
- Use of tools and equipment
- Technical presentation
- Web preparation skills
- Fibre preparation skills
- Carding skills
- Web laying skills
- Finishing of nonwoven fabric
- Fibre bonding skills
- Drying and curing skills
- Machine operation skills
- Machine maintenance skills
- Testing and evaluation of nonwoven fabric

REQUIRED KNOWLEDGE

The individual needs to demonstrate knowledge of:

- Type of textile fibres
- Laying methods
- Importance of web formation
- Methods of bonding
- Uses of nonwoven fabric
- Properties and performance of nonwoven fabrics
- Texting of nonwoven fabric
- Methods of curing of nonwoven
- Finishing methods of nonwovens
- Working of binders
- Fibre preparation
- Carding principles
- laying methods

EVIDENCE GUIDE

This provides advice on assessment and must be 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 Carried out nonwoven textile material preparation 1.2 Produced nonwoven products 1.3 Controlled production and quality parameters 1.4 Operated nonwoven machines
2. Resource Implications.	The following resources should be provided: 2.1 Testing equipment 2.2 Textile fibres 2.3 Nonwoven bonding machines 2.4 Resins and chemicals
3. Methods of Assessment.	***Competency may be assessed through:*** 3.1 Practical 3.2 Observation 3.3 Questionnaire 3.4 Written examinations 3.5 Oral presentation
4. Context of Assessment.	Competency may be assessed: 4.1 On-the-job

	4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment.	This unit may be assessed on an integrated basis with others within this occupational sector.

PROCESS TEXTILE FABRIC

UNIT CODE: ENG/OS/TEX/CR/06/6/A

Unit description

This unit describes the competencies required by a textile technician to process textile fabric. It involves competencies required to perform textile pre-treatment, textile dyeing, textile printing and textile finishing, control production and quality parameters.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These are assessable statements which specify the required level of performance for each of the elements	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicized terms are elaborated in the Range)***
1. Perform textile pre-treatment	1.1 ***Textile materials*** are obtained from the grey store according to production needs 1.2 Grey materials are loaded for inspection on the machine according to process requirements 1.3 The fabric inspection machine is operated according to operation procedures 1.4 ***Faults are identified*** and recorded according to standard requirements. 1.5 Fabric is sorted and graded according to grading system required 1.6 Grey fabric is singed according to job specifications 1.7 The singed fabric is desized according to the machine manuals 1.8 Scouring and washing is done on the desized fabric 1.9 Proper Bleaching of the fabric is done according to quality requirements 1.10 The bleached material is mercerized according to standard operating procedures. 1.11 The pre-treatment operations are documented according to organizational procedures.
2. Perform textile dyeing	2.1 Materials for dyeing are identified according to job requirement 2.2 Method of colouration/dyeing is determined according to process requirement

	2.3 Dyeing machines are inspected according to organizational procedures. 2.4 Dyeing parameters are set according to job specifications 2.5 Materials are loaded into dyeing machines according to machine capacity and operational manuals. 2.6 Dyeing machine is operated and monitored according to machine operation manuals and recipe 2.7 Dyeing machine is stopped and dyed materials offloaded according to SOPs 2.8 Dyed materials are dried and stored for next process according to specified conditions. 2.9 Dyeing process is documented according laid down procedures
3. Perform textile printing	3.1 Prepared materials are obtained according to organizational procedures 3.2 Printing technique is identified according to job specification 3.3 Printing machine parameters are set according to the operational manuals 3.4 Lead cloth is set in position according to SOPS 3.5 Prepared material is stitched to the lead cloth according to SOPS 3.6 Printing machines is operated and quality monitored according operational manuals 3.7 Printed cloth is doffed of according to operational manual 3.8 Printed doffed cloth is cured and washed according to standard operating procedures. 3.9 Printed fabric is stored according to specified conditions 3.10 Printed cloths are documented according to organizational procedure
4. Perform textile finishing	4.1 Textile materials for production are obtained according to production requirement 4.2 ***Textile finishing machineries, equipment and tools are obtained*** according to production requirement. 4.3 ***Methods of finishing*** are determined according to nature of polymer available

	4.4 Production parameters are set and determined according to production requirement. 4.5 Production machines are operated according to manufacturer's manual. 4.6 Finished products are delivered according to production requirement of the organization. 4.7 Textile finishing process is documented according to organization procedures.
5. Control production and quality parameters	5.1 Finishing production inputs are determined according to process machines. 5.2 Inspect finishing input according to the required quality parameters 5.3 Finishing parameters are determined according to product requirement. 5.4 Loading finishing schedule and production plan developed according to master production plan finishing target 5.5 Periodic quality parameters are monitored according to quality requirement. 5.6 Labour requirement are determined according to work load
6. Operate finishing machinery	6.1 ***Finishing machines*** are identified according to process layout 6.2 ***Machine safety and operation procedures*** are observed according to manufacturer manuals and OSHA 6.3 Machine status is checked and required routine maintenance is undertaken according to manufacturer's manual. 6.4 ***Machine Operating parameters*** are set according to production requirements 6.5 Machine control buttons are identified and operated according to standard operating procedures. 6.6 Finishing machines are operated according to manufacturer's manuals. 6.7 Selected finishing machines are installed according to process layout.

RANGE

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

Variable	Range
1. Textile materials may include but is not limited to:	• Fibres • Dyes pigments • Resins and binders • Fabric • Yarns • Dyes • Chemicals
2. Textile finishing machineries, equipment and tools are obtained may include but is not limited to:	• Stenter • Calendaring machine • Sanforizing machine • Raising machine • Printing machine
3. Methods of finishing may include but is not limited to:	• Raising • Calendaring • Sanforizing • Water proofing

REQUIRED SKILLS

The individual needs to demonstrate skills in:

- Interpreting and following information on written job instructions, manufacturer specifications, standard operating procedures, charts, lists, reports and other applicable reference documents
- Checking and clarifying information
- Reporting – oral/written
- Planning and sequencing tasks
- Identifying non-compliances
- Completing proformas, standard workplace forms, workplace reports and other applicable documents
- Checking for conformance to specifications
- Measuring to specified tolerances
- Performing numerical operations, geometry and engineering calculations/formulae within unit's scope
- Communication skills
- Problem solving
- Creativity and innovation
- Data collection and analysis

- Use of tools and equipment
- Technical presentation

REQUIRED KNOWLEDGE

The individual needs to demonstrate knowledge of:

- Textile finishing operations
- Properties of textile raw materials
- Characterization of textile raw materials.
- Quality control parameters
- Textile testing machine
- Identification of textile material defects and faults
- Applicable codes and standards
- Methods to locate, fix/fasten machine.
- Use and application of personal protective equipment
- Hazards and control measures associated with installing machine including housekeeping
- Safety practices and procedures
- Fasteners
- Use of tools and equipment
- Material handling
- Problem solving
- Data analysis and interpretation
- Documentation
- Testing and inspection
- Basic principle of operation of the equipment being installed
- Procedure for safe disposal of waste materials
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EVIDENCE GUIDE

This provides advice on assessment and must be 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 Performed textile pre-treatment 1.2 Performed textile dyeing 1.3 Performed textile printing 1.4 Performed textile finishing 1.5 Controlled production and quality parameters

2. Resource Implications.	The following resources should be provided: 2.1 Dyes stuffs 2.2 Pigments 2.3 Printing screens 2.4 Textile finishing machine 2.5 Textile finishing chemicals
3. Methods of Assessment.	***Competency may be assessed through:*** 3.1 Practical tests 3.2 Observation 3.3 Case studies 3.4 Written tests 3.5 Oral questioning
4. Context of Assessment.	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment.	This unit may be assessed on an integrated basis with others within this occupational sector.

MANAGE TEXTILE PRODUCTION PROCESS

UNIT CODE: ENG/OS/TEX/CR/7/6/A

Unit description

This unit describes the competencies required by a textile technician to manage textile production process. It involves competencies required to set up production process, operationalize production process, maintain production targets, control stock utilization, oversee plant maintenance, maintain production records, manage storage of raw materials and production outputs, manage production rejects and manage safety operations

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These are assessable statements which specify the required level of performance for each of the elements	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicized terms are elaborated in the Range)***
1. Set up production process	1.1 Item to be produced is identified according to work requirements. 1.2 Raw materials for production are checked according to production requirement. 1.3 Production machine is inspected according to manufacturer's specifications. 1.4 Labour availability is confirmed according to job requirements. 1.5 Production lines are inspected according to installation manual 1.6 Safety devices are checked according to health and safety regulations 1.7 Work area is set and cleaned according to safety regulations 1.8 Production line is tested according to operation manual
2. Operationalize production process	2.1 Production line settings are adjusted according required standards 2.2 Production line is run according to operation manual 2.3 Products are checked against expected standards 2.4 Faults are identified and rectified according to operational and quality procedures

	2.5 Finished products are packed and arranged according to prescribed procedures 2.6 Rejects are removed and secured according to health and safety guidelines
3. Maintain production targets	3.1 Production targets are set according to production requirements 3.2 Production personnel is informed of the set targets according to production requirements 3.3 Set targets are assigned to production personnel at each process stage according to production requirements 3.4 Follow up of set targets is made according to production requirements 3.5 Achieved targets are reviewed according to production requirements. 3.6 Production targets are assessed to ascertain if objectives have been met according to production plans. 3.7 Records of production targets are maintained according to production requirements.
4. Control raw materials utilization	4.1 Raw materials requirements are defined according to production needs. 4.2 Raw materials are re-ordered to replenish depleting stock according to company policies 4.3 Raw materials records are maintained according to SOPs.
5. Coordinate plant maintenance	5.1 Plant machineries are inspected regularly according to company regulations 5.2 ***Various maintenance*** schedules are planned according to company requirements 5.3 Production machines are availed for maintenance according to production plans. 5.4 Maintenance records are maintained according to SOPs
6. Maintain production records	6.1 Information and data to be reported is identified according to production requirements 6.2 Method of recording information and data is identified in accordance with company procedures 6.3 Production information and data is recorded according to company procedures 6.4 Production reports are generated in accordance with company procedures

	6.5 Records are processed and stored in accordance with company procedures
7. Manage storage of raw materials and production outputs	7.1 Storage section is kept clean in accordance with health and safety regulations 7.2 Storage conditions are kept as prescribed in storage manual 7.3 Hazardous and fragile raw materials and finished products are stored in special conditions as prescribed in health and safety regulations 7.4 Storage are updated according to SOPs 7.5 Stored raw material and finished goods are inspected regularly according to organisation's regulations
8. Manage production rejects	8.1 Plant machinery is maintained according to maintenance manual 8.2 Production staff is trained according to work requirements 8.3 Production parameters are set according to production requirements 8.4 Finished products are inspected according to production requirements 8.5 Rejects are isolated according to company policies
9. Manage safety operations	9.1 Personal protective equipment is provided all the time according to health and safety regulations 9.2 Daily safety inspections are made according to health and safety regulations 9.3 Safety precaution notices and posts are placed at strategic points according to health and safety regulations 9.4 5S's is implemented according to set down procedures. 9.5 Personnel feedback on safety issues is acted on according to health and safety regulations 9.6 Safety goals are set according to organisation's requirements 9.7 First aid operations are handled according to health and safety regulations 9.8 Plant inspection reports are reviewed according to safety and health regulations

10. Manage sectional staff	10.1 Leave rota is developed and planned according to organization procedures. 10.2 Jobs are allocated according to available job and experience. 10.3 Set time schedules are complied with in accordance with organizational regulations. 10.4 Disputes are resolved amicably as per organizational policies 10.5 Staff appraisal is conducted in accordance with organizational procedures

RANGE

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

Variable	Range
1. Tools and equipment may include but not limited to:	• Hand tools • Power tools
2. Types of maintenance may include but not limited to:	• Preventive maintenance • Corrective maintenance • Predictive maintenance

REQUIRED SKILLS

The individual needs to demonstrate skills in:

- Machine operation
- Communication skills
- Problem solving
- Data collection and analysis
- Service and repair of system components
- Fault diagnosis
- Attention to details

REQUIRED KNOWLEDGE

The individual needs to demonstrate knowledge of:

- Documentation
- Scheduling/planning for maintenance
- Service and repair of machinery
- Technical report writing
- Data analysis and interpretation
- Safety and hazards

- Problem solving
- Quality assurance
- Quality control
- Faults in production

EVIDENCE GUIDE

This provides advice on assessment and must be 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 Set up production process 1.2 Operationalized production process 1.3 Maintained production targets 1.4 Controlled stock utilization 1.5 Oversaw plant maintenance 1.6 Maintained production records 1.7 Managed storage of raw materials and production outputs 1.8 Managed production rejects 1.9 Managed safety operations
2. Resource Implications.	The following resources should be provided: 2.1 Computers 2.2 Whiteboards 2.3 Whiteboard markers 2.4 Manuals
3. Methods of Assessment.	***Competency may be assessed through:*** 3.1 Practical 3.2 Observation 3.3 Questionnaire 3.4 Case studies 3.5 Written examinations 3.6 Oral presentation
4. Context of Assessment.	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment
5. Guidance information for assessment.	This unit may be assessed on an integrated basis with others within this occupational sector.