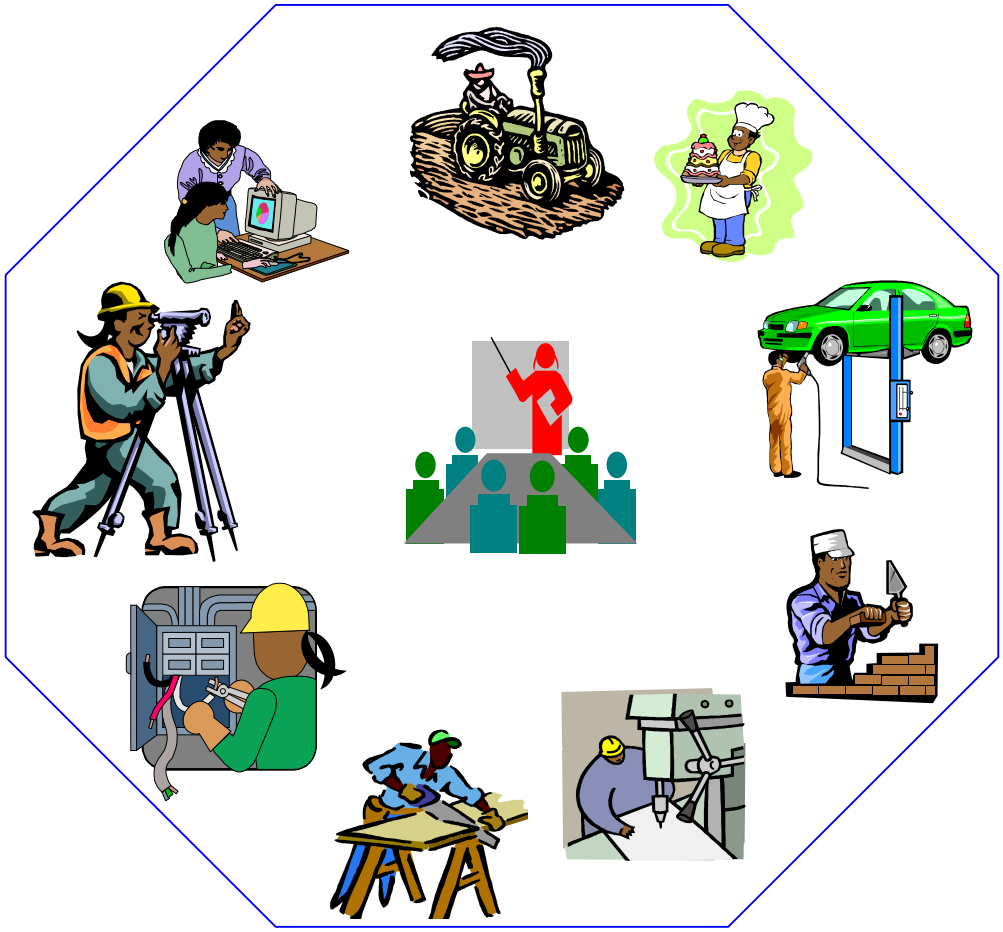
Federal Democratic Republic of Ethiopia

OCCUPATIONAL STANDARD

MECHANICS SUPERVISION

NTQF Level IV



Ministry of Education
February 2017

Introduction

Ethiopia has embarked on a process of reforming its TVET-System. Within the policies and strategies of the Ethiopian Government, technology transformation – by using international standards and international best practices as the basis, and, adopting, adapting and verifying them in the Ethiopian context – is a pivotal element. TVET is given an important role with regard to technology transfer. The new paradigm in the outcome-based TVET system is the orientation at the current and anticipated future demand of the economy and the labor market.

The Ethiopian Occupational Standards (EOS) is the core element of the Ethiopian National TVET-Strategy and an important factor within the context of the National TVET-Qualification Framework (NTQF).They are national Ethiopia standards, which define the occupational requirements and expected outcome related to a specific occupation without taking TVET delivery into account.

This document details the mandatory format, sequencing, wording and layout for the Ethiopia Occupational Standard which comprised of Units of Competence.

A Unit of Competence describes a distinct work activity. It is documented in a standard format that comprises:

- Occupational title, NTQF level
- Unit title
- Unit code
- Unit Descriptor
- Elements and Performance criteria
- Variables and Range statement
- Evidence guide

Together all the parts of a Unit of Competence guide the assessor in determining whether the candidate is competent.

The ensuing sections of this EOS document comprise a description of the respective occupation with all the key components of a Unit of Competence:

- the chart with an overview of all Units of Competence for the respective occupation including the Unit Codes and the Unit Titles
- the contents of each Unit of Competence (competence standard)
- occupational map providing the Technical and Vocational Education and Training (TVET) providers with information and important requirements to consider when designing training programs for this standards, and for the individual, a career path

UNIT OF COMPETENCE CHART

Occupational Standard: Mechanics Supervision		
Occupational Code: IND MCS4		
NTQF Level IV		
IND MCS4 01 0217 Develop Models	IND MCS4 02 0217 Calibrate Measuring Equipment	IND MCS4 03 0217 Analyse Plant and Equipment Condition Monitoring Results
IND MCS4 04 0217 Test and Commission the installation of Plant and Machineries	IND MCS4 05 0217 Estimate Manufacturing and Maintenance Cost	IND MCS4 06 0217 Supervise and Guide Computer-Integrated Manufacturing (CIM) Production Operations
IND MCS4 07 0217 Check Advanced Pneumatic and Hydraulic System	IND MCS4 08 0217 Perform Automated Thermal Cutting	IND MCS4 09 0217 Perform Brazing and/or Silver Soldering
IND MCS4 10 0217 Prepare and Produce Specialised Coatings	IND MCS4 11 0217 Implement and Monitor Environmentally Sustainable Work Practices	IND MCS4 12 0217 Plan and Organize Work
IND MCS4 13 0217 Migrate to New Technology	IND MCS4 14 0217 Establish Quality Standards	IND MCS4 15 0217 Develop Individuals and Team
IND MCS4 16 0217 Utilize Specialized Communication Skills	IND MCS4 17 0217 Manage Micro, Small and Medium Enterprises (MSMEs)	IND MCS4 18 0217 Apply Problem Solving Techniques and Tools

NTQF Level IV

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Develop Models**
Unit Code	**IND MCS4 01 0217**
Unit Descriptor	This unit specifies the competence required in laying-out, manufacturing and finishing prototype models

Elements	Performance Criteria
1. Determine work requirements	1.1. Requirements are identified from design program and brief. 1.2. Drawings, instructions and specifications are interpreted and understood based on standards 1.3. Appropriate ***materials*** are selected to meet ***specifications***. 1.4. Time schedule of specific work to be performed is prepared considering available resources based on the program requirements 1.5. Functional and formal relationships are studied with reference to the actual context and given specifications 1.6. Detail specifications are determined based on scope of work
2. Layout model	2.1. Finished model design is conceptualized and planned with reference to customer's specifications (written or verbal) for finish, quality and form, in accordance with operational procedures 2.2. Estimated cost calculation for ***models*** is accomplished in compliance with organizational processes 2.3. Contractions allowances, clearances, tapers etc. are calculated to establish model parameters due to standards applied 2.4. Datum boards, jigs and fixtures are designed and manufactured according to drawings
3. Manufacture model	3.1. Sequence of manufacture, including build-up on datum board, establishing datum's mark out of model and areas to be machined, are determined with reference to operational procedures 3.2. Appropriate machines and machining processes are selected to shape/produce model to specifications 3.3. A range of hand and hand held power tools are selected and used utilizing acceptable techniques and procedures to shape model to fine tolerances according to specifications. 3.4. Appropriate measurement/calculations are undertaken to check specifications, including coordinate measuring and machine checking as required

	3.5. All components are assembled according to drawings
4. Assure Quality	4.1. Functionality of model is tested in accordance with specifications and test procedures 4.2. Where necessary, all deviations or modifications to original tooling design, prints or plans, are recorded and reported consistent with standard operating procedures 4.3. Model documentation is compiled according to operational requirements

Variable	**Range**
Materials	May include, but not limited to: • Metal, timber, plastic, fiber glass, composites, etc.
Specifications	May include, but not limited to: • Technical or engineering drawing • Type of material • Work procedure • Unit of measurement • Cost estimation
Models	May include, but not limited to: • Machinery for food processing, • Agricultural equipment, • Jig and fixtures • Moulds and press dies • Production units • Packaging tools • Devices of all kind • Gearboxes and couplings • Valves and pumps • Hydraulic and pneumatic assembly devices • Steel structures and support elements • New technology application for equipment and devices
Engineering standards	May include, but not limited to: • Economic • Environmental • Sustainability • Manufacturability • Ethical • Health and Safety • Social and Political

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge in: • Complying with accepted engineering standard • Applying conventional graphic quality • Implementing precision in manufacturing and fitting and accuracy in description

	• Preparing consistent style of presentation
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Consequences of selecting inappropriate materials • Various processes requiring models • Calculus, engineering calculations and formulae relating to developing and manufacturing models • Properties and uses of datum boards, datum holes or datum faces • Reasons for developing the sequence of manufacture • The range of machines and machining processes and their operations • The various checking procedures and devices including coordinate measuring and machine testing • Procedures for recording deviation or modification to original drawings or specifications • Hazards and control measures associated with developing and manufacturing precision models • Safe work practices and procedures
Underpinning Skills	Demonstrates skills in: • Reading, interpreting and following information on written job instructions, specifications, standard operating procedures, drawings and other applicable reference documents • Selecting appropriate materials • Conceptualizing and determining type of model required to meet specifications • Performing calculations necessary for manufacture • Developing and manufacturing datum boards, datum holes or datum faces, jigs and fixtures etc. Required for accurate manufacture • Developing a planned sequence of manufacture • Identifying areas required to be accurately manufactured • Selecting and operating the appropriate range of machines and machining processes for manufacturing the model accurately to size, tolerance and specifications • Using required hand and hand held power tools • Measuring components to specified tolerances • Carrying out measurement and test procedures for accuracy and functionality • recording and writing reports
Resource Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview/Written Test • Observation/Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the workplace or in a simulated workplace setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Calibrate Measuring Equipment**
Unit Code	**IND MCS4 02 0217**
Unit Descriptor	This unit covers checking measuring equipment for correct operation, and validating/calibrating precision measuring equipment in accordance with predetermined procedures.

Element	Performance Criteria
1. Check equipment for correct operation	1.1. Appropriate checks are made of components, leads, fasteners, etc. 1.2. Components are checked for wear, loose connections or other faults.
2. Validate/calibrate precision measuring equipment	2.1. ***Calibration*** of precision measuring equipment is assessed to manufacturers' specifications and/or standard operating procedures. 2.2. Equipment are calibrated against appropriate ***physical standards*** using correct ***calibration devices, equipment, techniques*** using predetermined procedures. 2.3. Equipment are ***decommissioned*** in accordance with standard operating procedures.

Variables	Range
Calibration	May include, but not limited to: • To standardize the quantities of a measuring instrument
Physical standards	May include, but not limited to: • Reference standards of mass length, time, temperature, pressure, volume, process characteristics etc.
Calibration devices**,** equipment	May include, but not limited to: • Micrometre, Vernier calliper, voltmeter, oscilloscope, all types of comparators, jigs and fixtures, templates and patterns etc.
Techniques	May include, but not limited to: • In standard operating procedures, manufacturers' manuals
Decommissioning	May include, but not limited to: • Sealing, tagging, identification or storage in accordance with standard operating procedures

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge to: • Check measuring equipment for correct operation • validate/calibrate precision measuring equipment in accordance with predetermined procedures.

Underpinning Knowledge and Attitudes	• Measuring equipment specifications, operation, wearing parts, connections and components • Checks that are to be made of the measuring equipment and the tools and equipment to be used when checking the measuring equipment • Common fault(s) that may be found in the measuring equipment • Effects of faults on the performance/accuracy of the measuring equipment • General knowledge of standards, legislative or regulatory requirements applicable to the measuring equipment and/or its calibration • Standard operating procedures for calibrating the measuring equipment and the tools and equipment required to do so • Standard operating procedures for commissioning the measuring equipment • Calibration records to be kept/maintained in accordance with standard operating procedures • Hazards and controls associated with calibrating measuring equipment
Underpinning Skill	Demonstrate knowledge of: • Interpreting work requirements • Using appropriate tools and equipment to check measuring equipment for faults • Using appropriate techniques to check the calibration of the measuring equipment for conformance to specifications • Calibrating the measuring equipment against the appropriate physical standard • Decommissioning the measuring equipment • Using literacy and numeracy skills to enable correct completion of calibration records
Resource Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview/Written Test • Observation/Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the workplace or in a simulated workplace setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Analyse Plant and Equipment Condition Monitoring Results**
Unit Code	**IND MCS4 03 0217**
Unit Descriptor	This unit covers analyzing condition monitoring results and developing recommendations based on the analysis. The data analyzed is generated by a continuous plant and equipment condition monitoring program.

Element	Performance Criteria
1. Analyse condition monitoring results	1.1. Records/graphs/results of condition monitoring are examined and analysed and problem areas are identified. 1.2. Necessary ***calculations***/computations are undertaken. 1.3. Appropriate reports/determinations of analyses are undertaken to prescribe site procedure.
2. Develop recommendations	2.1. Recommendations are developed based on previous history, results, specifications and ***legislative requirements***. 2.2. Recommendations are reported to appropriate authority.

Variables	Range
Calculations	May include, but not limited to: • Measuring, Multiplying, Subtracting, Adding, Dividing etc.
Legislative requirements	May include, but not limited to: • Rules, laws, etc.

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge to: • Examine and analyse records/graphs/results of condition monitoring. • Identify problem areas • Develop recommendations based on previous history, results, specifications and legislative requirements • Report Recommendations to appropriate authority.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • The operational specifications of the plant/equipment being monitored • Any trends and/or deviations from operational specifications • Numerical operations and calculations/formulae for data analysis within the scope of this unit • The reasons for undertaking the identified calculations • The procedures for reporting the analysis of condition monitoring data • The previous history of the plant/equipment being monitored • Any relevant legislative requirements

	• The operational specifications of the plant/equipment • The recommendations with respect to action to be taken • The reasons for the recommendations made • The expected effect of the recommendations on the operational performance of the plant/equipment • The procedures for reporting recommendations • The authority/person to whom the recommendations are to be made
Underpinning Skill	Demonstrate skills of: • Obtaining results of condition monitoring of plant/equipment • Performing calculations to analyse condition monitoring data • Preparing reports based on the analysis of the condition monitoring data • Reporting recommendations to the appropriate authority • Orally reporting routine information
Resource Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview/Written Test • Observation/Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the workplace or in a simulated workplace setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Test and Commission the installation of Plant and Machineries**
Unit Code	**IND MCS4 04 0217**
Unit Descriptor	This unit of competency describes the outcomes required to plan and implement the testing and commissioning of plant and machineries. The ability to interpret technical information, identify and assess hazards and perform technical testing procedures are essential to performance.

Elements	Performance Criteria
1. Plan and prepare for testing and commissioning of systems	1.1. Check plans for the section to be tested and features located on site. 1.2. The system operation requirements are identified and interpreted correctly. 1.3. Testing ***tools and equipment*** are selected, checked and used for accuracy. 1.4. ***Potential hazards*** are identified and assessed and required preventative measures taken. 1.5. Testing and commissioning tasks are confirmed from ***relevant documentation*** and scheduled appropriately. 1.6. Vacuum testing tasks are checked from relevant documentation and scheduled appropriately.
2. Conduct production machineries and commissioning performance	2.1. Tensioning and measuring equipment are selected and installed correctly. 2.2. Level gauges of the correct range are selected and fitted to test equipment. 2.3. ***Testing procedures*** are carried out according to ***organizational and statutory requirements***. 2.4. Failed gear box, oil tank and screws are located accurately and reporting and testing rescheduled. 2.5. Failed maintenance holes, inspection shafts, maintenance shafts or other access structures and rescheduled testing are located and reported accurately. 2.6. Oil disinfection is arranged according to organizational and statutory requirements. 2.7. Contaminated or damaged(burned) oil is disposed of according to organizational requirements.
3. Ensure testing the plant and machineries	3.1. The testing of plant and machineries is ensured to be operational according to specifications and organizational procedures. 3.2. The work site is restored to meet environmental and organizational requirements.

	3.3. Equipment tools and materials are checked, maintained and stored according to manufacturer guidelines and organizational procedures.
4. Finalize and report the documentation work	4.1. Workplace records are maintained according to organizational and statutory requirements. 4.2. Calibration records and certificates are maintained in accordance with organizational and statutory requirements 4.3. All the activities are reported according to the organizational requirement

Variable	**Range**
Tools and equipment	May include, but not limited to: • Hand and power tools • Lifting and winching equipment • Testing equipment • Communication equipment • Line plugs • Level gauges • Personal protective equipment
Potential hazards	May include, but not limited to: • Work in confined spaces • Work involving lifting and moving materials • Working in a fire location • Health hazards associated with working in damaged oil areas
Relevant documentation	May include, but not limited to: • Manufacturer's specifications • Organizational procedures
Testing procedures	May include, but not limited to: • Level test • Leakage test • Parametric test
Organizational and statutory requirements	May include, but not limited to: • By-laws • Organizational policies • Standard operating procedures • Environmental protection • Occupational health and safety guidelines for: • Lifts and cranes • Electrical • Dangerous goods

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • Planning the testing of plant/machineries operation systems

	• Identifying and analyzing the testing requirements of the system from relevant plans and documentation • Preparing and checking testing equipment • Assessing risks and hazards and taking appropriate preventive measures • Using testing equipment correctly • Applying testing procedures accurately • Maintaining the quality of machineries in manufacturing system • Identifying and reporting faulty system components • Restoring the worksite • Making the system operational and conducting post-commissioning checks • Completing relevant documentation • Completing required reports and records
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • General occupational health and safety on work sites • The risk factors and potential hazards of test procedures • Characteristics of machineries, materials and connections • Layout and construction of damaged components collection systems • Testing procedures for machineries manufacturing systems • Equipment operation • Environmental aspects of test procedures • Relevant definitions, terminology, symbols and language • testing methods used for plant/machineries operational systems
Underpinning Skills	Demonstrates skills to: • Communicate effectively and appropriately with colleagues and contractors • Communicate the implementation of OHS policies and procedures • Interpret and apply a range of technical documents including relevant: ➢ Regulatory, legislative, licensing and organizational requirements ➢ Codes and standards ➢ Specifications ➢ Organizational policies • Conduct test procedures • Identify system faults • Use test equipment • Monitor work processes and ensures safe work practices • Identify reports and records hazards and risks • Use personal protective equipment • Participate in ensuring compliance with standards, regulations and policies

	• Maintain and check records and documents
Resource Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview/Written Test • Observation/Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the workplace or in a simulated workplace setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Estimate Manufacturing and Maintenance Cost**
Unit Code	**IND MCS4 05 0217**
Unit Descriptor	This unit covers the knowledge, skills and attitude required in applying principles and concepts associated with the preparation of a cost estimate for a product or project. To be manufactured or maintained /repaired. It includes materials and labor together with the application of relevant overhead cost and margins.

Elements	Performance Criteria
1. Collect information	1.1. ***Tender/cost estimate brief*** is obtained and ***key requirements*** identified within established organizational framework, procedures and routines 1.2. Appropriate project plans and specifications are read and understood based on requirements 1.3. Measurements are made and quantities identified from plans and specifications and which conforms to standards industry practice 1.4. Labor unit cost projections are obtained and agreed based on labour agreements 1.5. Logistic support contracts, supply agreements or equivalent are obtained and analyzed due to organizational procedures 1.6. Details of proposed warehousing or spare part storage and physical distribution systems and related cost factors are obtained to requirements 1.7. Information is converted to usable form and stored ready for retrieval and application due to applied standards
2. Determine labor cost	2.1. The types and numbers of appropriate personnel are identified and the time required is estimated based on organizational regulations 2.2. The labor hours for non-contract elements of work are calculated based on standard procedures 2.3. Time requirements for work activities and other lead times are estimated due to specifications 2.4. The costs or rates for required work are calculated
3. Establish physical resource requirements	3.1. Physical resource requirements are identified due to requirements 3.2. Lists of materials are produced and quantities calculated based on work plan 3.3. Quantities against project or standard contracts are established due to specifications

	3.4. Supplier prices for materials and consumables are obtained according to organizational procedures 3.5. Plant or equipment requirements are identified and costed.
4. Develop estimated product/project costs	4.1. Appropriate labor rates and material costs are selected and applied by labour laws 4.2. Estimates of unit costs, as appropriate, are determined and applied based on requirements 4.3. Costs to the project of work cover, environmental protection agency requirements, seeking approvals, waste management fees and other statutory or additional costs are identified and applied to standard 4.4. Company overhead recovery and margins are applied based on specifications 4.5. Completed estimated ***project costs*** for inclusion in a maintenance and repair plan or tender or bill are calculated due to requirements
5. Verify cost estimate	5.1. Actual cost information is sourced from a completed project and compared with specifications 5.2. Actual costs are compared with estimated cost to identify deviations. 5.3. Deviations are explained according to established organizational framework, procedures and routines. 5.4. Assistance/approval is obtained from management.

Variable	**Range**
Tender/cost estimate brief	May include, but not limited to: • Estimate relates to a maintenance & repair project or discrete product with a limited number of operations for manufacture • May include project guidelines and instructions, internal or external requirements, information from tender/contract documents, drawing specifications
Key requirements	May include, but not limited to: • Timing, • Budget, • Resources, • Output and special conditions
Project costs	May include, but not limited to: • Organizational and subcontract labor hours • Project administration costs

	• Overheads • Consumable and production materials • Cost of meeting statutory requirements • Waste removal fees • Utilities/resource consumption • Communications costs
Plans and/or specifications	May include, but not limited to: • Sketches or drawings • Statements of requirements • Materials lists and quantity schedules • Materials specifications

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge to: • Identifying the materials and parts required for a product/project • Gathering information about material and spare part supply • Interpreting measurements and calculating quantities and costs • Planning and allocating human resources • Identifying and costing other related costs such as those required to meet statutory and regulatory processes • Producing documentation which meets the timeframes and quality standards established by the organization • Communicating effectively, both verbally and in writing
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Government regulations/legislations and standards • Types of working drawings and specifications • Types, scope and usage of labor through the employee and sub-contractor systems • Operation and structure of organizational costing and contracting system
Underpinning Skills	Demonstrates skills in: • Undertaking numerical operations, geometry and calculations/formulae within the scope of this unit • Calculating labor hours and costs • Calculating materials quantities and costs • Extrapolating labor and materials costs from written information • Reading drawings and specifications • Planning and sequencing operations ➢ Using estimates as targets ➢ Impact of value adding non-value adding activities • Leading times associated with: ➢ Raw material availability ➢ Equipment, tool design and commissioning

	➢ Models and trial builds ➢ Estimating processes ➢ Use of contract documents – drawings, specifications ➢ Consideration of general conditions and any special conditions ➢ Application of resources costs – hourly rates (labour, plant, material, subcontractors) ➢ Contingency costs ➢ Allowance for contract variations • Hazards and control measures associated with preparing a cost estimate for a manufactured product, including allowing for housekeeping, safe work practices and procedures
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview/Written Test • Observation/Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Supervise and Guide Computer-Integrated Manufacturing (CIM) Production Operations**
Unit Code	**IND MCS4 06 0217**
Unit Descriptor	This unit covers the competency required of supervising and guiding production operations including control of machine and processes and the capture of manufacturing data through conventional or CIM processes

Elements	Performance Criteria
1. Interpret the design brief or scope of production including CIM system	1.1. Required features and extent of integration of the CIM system are established in consultation with the client based on applicable operational regulations 1.2. Technical, commercial and environmental parameters are established to the scope of work in accordance with organizational procedures 1.3. Technical managers and senior design engineers are consulted in determining a production process in compliance with engineering standards 1.4. OHS, regulatory requirements and enterprise procedures relevant to scope of work are considered 1.5. Preliminary advice on feasibility of manual or possible CIM project are collected and presented to client based on engineering environment
2. Prepare production process including possible CIM system	2.1. Investigations and measurements are performed based on scope of work and operational standards 2.2. Required modelling and calculations are carried out using ***appropriate software and validation techniques*** according to production specifications 2.3. A range of conventional and CIM production solutions are generated using appropriate innovative and creative engineering specifications 2.4. Feasibility and evaluate solutions are checked against design criteria ensuring conformity to ***standards and codes***, technical, economic and OHS requirements 2.5. Social and sustainability implications of solutions are determined according to organizational specifications 2.6. Concept proposals is reviewed with client and identify preferred solution according to operational procedures
3.Perform supervision of conventional and /or CIM supported production	3.1. Conventional production processes are planned in comparison to CIM design based on results of external feasibility study and organizational requirements

	3.2. Documentation, drawings, specifications and instructions are provided in accordance with industry standards 3.3. Client and stakeholders are consulted in accordance with company procedures 3.4. Approved drafted production process is prepared for implementation according to operational requirements and standards
4. Assure quality production process	4.1. Production standards are applied (preferable ISO 9001 and 14001…) during the manufacturing process according to industry requirements

Variable	**Range**
Appropriate software and validation techniques	May include, but not limited to: • Comparison of traditional solutions for simple design problems with software solutions to the same design problems • Review of previously implemented design challenges which were completed using the software
Standards and codes	Refer to all relevant international standards and codes applicable to a particular design task
Parameters of the brief or contract	May include, but not limited to: • Design cost and system capital cost • Maintainability and product life cycle cost • Durability, function, performance and aesthetics • Energy and environmental sustainability and social issues • Equipment availability and worksite restrictions • Other special features and limits in the design brief
Conventional manufacturing	Limited use of ICT's and the conventional part May include, but not limited to: • Analysis • Planning • Purchasing • Materials handling and management • Providing direct control • Supervision of operations.
CIM manufacturing	Using ICTs 'to control the entire production process. It May include, but not limited to: • Computer-aided Design/Computer-aided Manufacturing (CAD/CAM) • Computer-aided Process Planning (CAPP) • Computer Numerical Control (CNC) machine tools • Direct Numerical Control (DNC) machine tools • Flexible Machining Systems (FMS) • Automated Storage and Retrieval Systems (ASRS) • Automated Guided Vehicles (AGV)

	• Use of robotics and automated conveyance • Computerised scheduling • Production and inventory control • A business system integrated by a common database
Range of solutions	for CIM systems May include, but not limited to: • Hardware options • Software options and systems
OHS, regulatory, sustainability and environmental issues	May include, but not limited to: • OHS Acts and regulations • Relevant standards • Industry codes of practice • Risk assessments • Registration requirements • Safe work practices • Minimising ecological and environmental footprint of process, plant and product • Maximising economic benefit of process plant and product to the organisation and the community • Minimising the negative OHS impact on employees, community and customer • State and territory regulatory requirements
Communications protocols	Refer to the set of standardised rules for data and signal syntax, checking and error detection. Hardware and software generated data in accordance with a protocol allows generators and receivers to understand or translate the data as information, control signals integrity and error checks.
Automation safety	Refers to the reliance on emergency stop, failsafe design, redundancy, interlocks and data integrity. Standards apply to general plant design and use as well as the functional safety of safety-related electrical, electronic and programmable electronic control systems.

Evidence Guide	
Critical Aspects of Competence	Must demonstrate knowledge and skills to: • Interpret features of plant and equipment and parameters to the brief or contract • Advise client based on discipline knowledge and OHS and regulatory standards • Research sustainability implications and current industrial design techniques • Determine OHS, regulatory and risk management requirements • Investigate and measure • Model and calculate using appropriate software and validation techniques • Generate and evaluate a range of solutions for feasibility against design criteria • Sketch a conventional and CIM system solution

	• Communicate, negotiate and review with stakeholders and client throughout process to obtain agreement on proposal and sign-off on design • Document design with drawings, specifications and instructions.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • Current CIM design knowledge, skills and techniques, including mechanical, electrical, fluid, electronic and information technologies, sensor/transducers, controllers, interfacing and signal conditioning, networking, software, data sharing and control functions • Techniques for: ➢ continuous improvement ➢ problem solving and decision making • Root Cause Analysis (RCA) or Failure Mode and Effects Analysis (FMEA) or Design Review Based on Failure Mode (DRBFM), and Pareto analysis • Features and capability of plant, equipment, controllers, software, network and communication systems • OHS and regulatory requirements, codes of practice, standards, risk management and registration requirements • Contemporary engineering design methods • Software options for control and data sharing • Hardware options and capabilities to suit processes and products • Documentation, drawings, specifications, instructions required, process information and programming
Underpinning Skills	Demonstrate skills in: • Determining features of CIM system, including OHS, regulatory and risk management requirements • Interpreting parameters to the brief or contract • Investigating and presenting options • Investigating faults in existing designs and arriving at solutions • Selecting and using software and validation techniques • Creating design solutions to match client expectations of innovation as well as fitness for purpose • Supervising services, maintainability, cost, manufacturability and assembly, and ease of operation • Evaluating solutions for feasibility against design criteria, including relevant engineering and financial calculations and analysis • Communicating, negotiating and reviewing with stakeholders and client throughout process to obtain agreement on proposal and sign-off on design • Documenting design with drawings, specifications and instructions

Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be accessed through: • Interview/Written test • Observation/Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the workplace or in a simulated workplace setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Check Advanced Pneumatic and Hydraulic System**
Unit Code	**IND MCS4 07 0217**
Unit Descriptor	This unit covers checking pneumatic and hydraulic system components, and identifying and repairing or replacing faulty components.

Elements	Performance Criteria
1. Check advanced pneumatic and hydraulic system components	1.1. Advanced pneumatic and hydraulic system ***components*** are identified correctly. 1.2. The characteristics and operational function of each system component are understood. 1.3. The operational function of each component is inspected and tested. 1.4. Correct operation of each component is assessed against specifications.
2. Identify, repair or replace faulty pneumatic and hydraulic system components	2.1. Faulty system components are localised and malfunction is confirmed by inspection and testing using fluid power principles, procedures and safety requirements. 2.2. Faulty system components are dismantled and repaired to manufacturers'/site specifications. 2.3. Replacement parts are selected from manufacturers' catalogue according to required specifications. 2.4. System components are reassembled and verified for correct operation and tested against specifications. 2.5. Correct operation of the pneumatic system is confirmed to standard operating procedures. 2.6. Appropriate follow-up procedures are adopted according to standard operating procedures. 2.7. Where appropriate, service reports are completed using standard operating procedures.
3. Quality Assure and maintain work	3.1. All components and lines are tested and recorded on functionality and leakages due to operational and test pressure requirements 3.2. Appropriate follow-up procedures are adopted according to standard operating procedures 3.3. ***Test equipment*** and procedures are documented according to regulations 3.4. Work site is cleaned and all debris are cleared of and left safe in accordance with the company requirements

Variable	Range
Components	May include, but not limited to: • Compressors • Pumps • Reservoirs • Pressure regulators • Instrumentation • Piping • Seals • Connectors • Valves • Manometers • Actuators (electrical, mechanical, pilot) • Cylinders • Relief valves • Drivers
Testing equipment	May include, but not limited to: • Pressure meter • Leakage detectors • Multi meters • Process switches

Evidence Guide	
Critical Aspects of Competence	Demonstrate Skills and Knowledge to: • Check pneumatic and hydraulic system components, • Identify and repair or replace faulty components
Underpinning Knowledge and Attitudes	Demonstrate Knowledge of: • The full range of pneumatic system components • Characteristics/operational function of each component • Procedures for inspecting and testing pneumatic system components • Equipment to test pneumatic system components • The specifications of each pneumatic system component • Faulty system components • Causes of faulty pneumatic components • Individual components within the pneumatic system • The safety procedures for working on pneumatic components • The procedure for repairing pneumatic system components • Procedures for checking pneumatic system operation • Follow-up procedures with respect to repaired/replaced pneumatic system components • Reporting/recording procedures • Hazard and control measures associated with maintaining pneumatic system components, including housekeeping • Safe work practices and procedures

Underpinning Skills	Demonstrate Skills in: • Inspecting and testing pneumatic system components • Obtaining, interpreting and following written job instructions, specifications, standard operating procedures, charts, lists, drawings, relevant data sheets and other applicable reference documents • Planning and sequencing operations • Checking and clarifying task-related information • Checking individual components within the pneumatic system for correct operation • Dismantling and repairing faulty system components • Selecting replacement parts from manufacturers'/suppliers' catalogues • Assembling pneumatic system components • Testing pneumatic components for correct operation and conformance to specifications • Checking the operation of the pneumatic system for conformance to specification • Checking repaired/replaced pneumatic system components for correct operation • Completing service reports
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview/Written Test • Observation/Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Perform Automated Thermal Cutting**
Unit Code	**IND MCS4 08 0217**
Unit Descriptor	This unit covers setting up and using single and multi-headed automated thermal cutting machines.

Element	Performance Criteria
1. Set up material	1.1. ***Material*** is set up, including correct procedures for stack cutting and nesting to minimise waste.
2. Set up and use automated cutting machine	2.1. Appropriate ***cutting medium*** is selected and set to specification. 2.2. Process requirements are determined from specifications or instructions. 2.3. ***Machine*** is set up safely to specifications using standard operating procedures. 2.4. ***Correct program*** is selected and loaded to standard operating procedure. 2.5. Machine datum are established to specifications.
3. Use automated thermal cutting machine	3.1. Where required, cutting medium is ignited following standard operating procedures. 3.2. Machine is started using correct sequence and procedure. 3.3. Powder marking and other ***tracing devices*** are used as required to standard operating procedures. 3.4. Correct shut-down procedure is observed in accordance with standard operating procedures.

Variables	Range
Material	May include, but not limited to: • Ferrous and non-ferrous
Cutting medium	May include, but not limited to: • Fuel gases, oxy acetylene, plasma arc, laser etc.
Machine	May include, but not limited to: • Single or multi-headed machines including NC driven equipment etc.
Correct program	May include, but not limited to: • Programs on Numerically Controlled (NC) machines are selected and loaded according to predetermined instructions
Tracing devices	May include, but not limited to: • Powder marking and magnetic, photoelectric tracing devices

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge to: • Setup thermal cutting machines • Identify and operate multi-headed automated thermal cutting machines
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Material set-up procedures. • Advantages of stack cutting and nesting • Procedures for establishing machine datum • Hazards associated with igniting cutting media • Safety precautions to be taken when starting and shutting down the machine. • Procedures for using powder marking and other tracing devices. • Use and application of personal protective equipment for automated thermal cutting • Safe work practices and procedures
Underpinning Skills	Demonstrates skills in: • Setting up materials and machines • Using thermal cutting machines • Reading and interpreting routine information on written job instructions, specifications and standard operating procedures • Following oral instruction
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview/Written Test • Observation/Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Perform Brazing and/or Silver Soldering**
Unit Code	**IND MCS4 09 0217**
Unit Descriptor	This unit covers performing brazing (including braze welding) and/or silver soldering. It includes the preparation of materials and equipment and the inspection of the completed work.

Element	Performance Criteria
1. Prepare materials and equipment	1.1. Job requirements are determined from specifications and/ or instructions. 1.2. ***Materials*** are correctly prepared using appropriate tools and techniques. 1.3. Materials are correctly assembled/aligned to meet specifications as required. 1.4. Distortion prevention measures are identified and appropriate action is taken as required. 1.5. ***Heating*** equipment is assembled and set up safely and correctly in accordance with standard operating procedures. 1.6. Correct and appropriate consumables are selected and prepared. 1.7. Test run is undertaken and verified as required.
2. Braze and/or silver solder	2.1. The correct ***process*** is selected to meet specifications. 2.2. Materials are preheated as required. 2.3. ***Consumables*** are applied using correct techniques. 2.4. Jointing material is applied correctly and in appropriate quantities to meet job/specifications. 2.5. Material temperature is annealed using correct and appropriate techniques.
3. Inspect joints	3.1. Excess jointing materials are removed using correct and appropriate techniques. 3.2. Inspection of joints is undertaken to standard operating procedures. 3.3. Inspection results are reported/recorded using standard operating procedures as required.

Variables	Range
Materials	May include, but not limited to: • Ferrous and non-ferrous
Heating	May include, but not limited to: • Oxy acetylene and fuel gas, cylinders, connections, Hoses,

	Tips And Nozzles
Process	May include, but not limited to: • Brazing, braze welding and silver soldering
Consumables	May include, but not limited to: • Fluxes (resin or powder), all types of silver solder and brazing grades, etc.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge to: • perform brazing (including braze welding) • Perform silver soldering. • Prepare materials and equipment. • Inspect the completed work
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • The reasons for selecting specific methods of assembly/alignment • The procedures for minimising distortion of the materials being brazed/braze welded/silver soldered • The procedures for assembling and setting up the specific heating equipment • The reasons for selecting specific heating equipment • The reasons for selecting specific consumables • Conducting test runs • Typical applications of brazing/braze welding and silver soldering processes • The procedures and precautions for preheating the materials to be joined • The effects of the use of inappropriate techniques on the performance of the jointed materials • The effect of inappropriate quantities of jointing material on the performance of the jointed materials • The procedures for normalising the temperature of jointed materials • The consequences of using inappropriate techniques to normalise the temperature of the joint • The procedures for removing excess jointing material • The procedures for inspecting brazed/braze welded/silver soldered joints • Use and application of personal protective equipment for silver soldering and brazing/braze welding • Safe work practices and procedures
Underpinning Skills	Demonstrates skills of: • Preparing materials • Performing brazing, braze welding, silver soldering • Undertaking visual inspection • Reading and interpreting routine information on written job instructions, specifications and standard operating procedures

	• Following oral instructions
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview/Written Test • Observation/Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Prepare and Produce Specialised Coatings**
Unit Code	**IND MCS4 10 0217**
Unit Descriptor	This unit covers the skills, knowledge, and attitude to undertaking masking and jig work, determining operational parameters, and pre-treating and treating work.

Element	Performance Criteria
1. Undertake mask and jig work	1.1. Jigs are secured and masking is adherent and stable. 1.2. Necessary ***auxiliary electrodes and shields*** are incorporated effectively. 1.3. Necessary jigs and shields are manufactured.
2. Determine operating parameters	2.1. Plating knowledge and/or specifications are applied in correctly computing operating times, currents and/or voltages. 2.2. Materials for coating are selected based on the type of material and standard.
3. Pre-treat and treat work	3.1. Machines for pre-treatment of work are selected based on the standard. 3.2. Work is treated in accordance with specifications using standard operating procedures.

Variables	Range
Auxiliary electrodes and shields	May include, but not limited to: • Soluble auxiliary anodes • Insoluble auxiliary anodes • Bi polar electrodes • Shields • Robbers

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge to: • Undertake masking and jig work • Determining operational parameters • Pre-treat and treat work.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • The reasons for masking work being electroplated • The range of materials that are used for masking purposes • The procedures for securing the masking • The reasons for using auxiliary electrodes and shields • The procedures for mounting/setting up auxiliary electrodes and shields • The specifications of the jigs and shields to be manufactured

	• The procedures for manufacturing jigs and shields • The procedures and formulae for calculating operating times, currents and voltages • The specifications of the surface finish to be achieved • The procedures for pre-treating the work • The procedure for treating the work after electroplating • The pre-electroplating and post electroplating treatment specifications • The reasons for pre-electroplating and post electroplating treatment of surfaces • Hazards and control measures associated with preparing and producing specialised coatings electrolytically • Safe workplace practices and procedures
Underpinning Skill	Demonstrates skills of: • Securing the electroplating jigs • Correctly masking • Setting up auxiliary electrodes and shields • Manufacturing jigs and shields in accordance with specifications • Correctly calculating the operating parameters • Treating the work • Reading and interpreting routine information on written job instructions, specifications and standard operating procedures. May include drawings • Following oral instructions • Performing calculations using formulae
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview/Written Test • Observation/Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Implement and Monitor Environmentally Sustainable Work Practices**
Unit Code	**IND MCS4 11 0217**
Unit Descriptor	This competency covers the outcomes required to effectively analyse the workplace in relation to environmentally sustainable work practices and to implement improvements and monitor their effectiveness.

Elements	Performance Criteria
1. Investigate current practices in relation to resource usage.	1.1. Environmental regulations applying to the enterprise are identified. 1.2. ***Procedures*** are assessed for assessing ***compliance*** with environmental regulations. 1.3. Information on environmental and resource efficiency systems and procedures are collected, and provided to the work group where appropriate. 1.4. Current resource usage is ***measured*** and recorded by members of the work group. 1.5. Current ***purchasing strategies*** are analysed and recorded. 1.6. Current work processes are analysed to access information and data and assisted in identifying areas for improvement.
2. Set targets for improvements.	2.1. Input is sought from ***stakeholders, key personnel and specialists***. 2.2. External sources of information and data are accessed, as required. 2.3. Alternative solutions are evaluated to workplace environmental issues. 2.4. Efficiency targets are set.
3. Implement performance improvement strategies.	3.1. ***Techniques and tools*** are sourced to assist in achieving targets. 3.2. Continuous improvement strategies are applied to own work area of responsibility and ideas and possible solutions communicated to the work group and management. 3.3. Environmental and resource efficiency improvement plans for own work group are integrated with other operational activities and implemented. 3.4. ***Suggestions*** and ideas about environmental and resource efficiency management are sought from stakeholders and act upon them where appropriate.

	3.5. Costing strategies are implemented to fully value environmental assets.
4. Monitor performance.	4.1. Outcomes are documented and reports on targets communicated to key personnel and stakeholders. 4.2. Strategies are evaluated. 4.3. New targets are set and new tools and strategies investigated and applied. 4.4. Successful strategies are promoted and participants rewarded, where possible.

Variables	**Range**
Procedures	Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards. Where reference is made to industry codes of practice, and/or Ethiopian/international standards, the latest version must be used.
Compliance	includes meeting relevant federal, state and local government laws, by-laws, regulations and codes of practice.
Measurement	May include, but not limited to: • Material fed to/consumed by plant/equipment • Plant meters and gauges • Job cards including kanbans • Examination of invoices from suppliers • Measurements made under different conditions • Examination of relevant information and data • Others as appropriate to the specific industry contexts.
Purchasing strategies	May include, but not limited to: • Influencing suppliers to take up environmental sustainability • Selecting materials/components with a lower environmental profile.
Stakeholders**,** key personnel and specialists	May include, but not limited to individuals and groups both inside and outside the organisation that have some direct interest in the enterprise's conduct, actions, products and services, including: • Employees at all levels of the organisation • Customers • Suppliers • Other organisations • Key personnel within the organisation, and specialists outside it who may have particular technical expertise
Techniques and tools	May include, but not limited to: • Visual workplace concepts • Measurement, display and/or recording devices • Changed work practices/procedures

	• Competence development and awareness training • Process and equipment items
Suggestions	May include, but not limited to: • Prevent and minimise environmental risks and maximise opportunities • Reduce emissions of greenhouse gases • Reduce use of non-renewable resources • Make more efficient use of energy, water and other resources • Maximise opportunities to reuse and recycle materials • Identify strategies to offset or mitigate environmental impacts. E.g. Purchasing of carbon credits • Express purchasing power through the selection of suppliers with improved environmental performance. E.g. Purchasing renewable energy and materials with lower embedded carbon • Eliminate the use of hazardous and toxic materials increasing the reusability/recyclability of wastes/products.
Environmental and resource efficiency issues	May include, but not limited to: • Addressing environmental and resource sustainability initiatives such as Environmental Management Systems, action plans, surveys and audits • Reference to standards, guidelines and approaches such as: ➢ ISO 14001 Environmental Management Systems ➢ Life Cycle Analyses ➢ Cradle to cradle ➢ Global Reporting Initiative ➢ Ecological foot printing ➢ Triple Bottom Line reporting and Product Stewardship • Determining enterprise's most appropriate waste treatment including waste to landfill, recycling, re-use and wastewater treatment • Applying the waste management hierarchy in the workplace • Initiating and/or maintaining appropriate enterprise procedures for operational energy consumption, including stationary energy and non-stationary (transport) • Efficient use of water • Minimising greenhouse gas emissions • Use of controls to minimise the risk of environmental damage from hazardous substances
Incidents	May include, but not limited to: • Breaches or potential breaches of regulations • Occurrences outside of standard procedure which may lead to lower environmental performance

Evidence Guide	
Critical Aspects of Competence	A person must be able to demonstrate: • Provide evidence of the ability to implement and monitor integrated environmental and resource efficiency management policies and procedures within an organisation. • Monitor and investigate current resource usage • Develop plans to improve sustainability • Implement environmental improvements. Consistent performance should be demonstrated. For example, look to see that: • Environmental performance is routinely monitored and investigated • Areas for improvements are followed through and the implemented changes are in turn monitored and investigated.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • How to access and use relevant environmental and resource efficiency systems, tools and procedures • Understanding of best practice approaches relevant to own area of responsibility • Strategies to maximise opportunities and minimise impacts relevant to own work area • Relevant environmental and resource efficiency issues specific to industry practices • Methods for measuring and calculating resource usage
Underpinning Skills	Demonstrate skills of: • Using relevant environmental and resource efficiency systems, tools and procedures • Applying quality assurance systems relevant to own work area • Applying relevant supply chain procedures • Measurement and calculation techniques • Communication/consultation skills to ensure information is supplied to the work group • Reading and writing is required to comprehend documentation and interpret environmental and energy efficiency requirements and to document and maintain records • Numeracy is required to interpret numeric workplace information, readings and measurements, handle data as required and complete numeric components of workplace forms/reports.
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview/Written Test

	• Observation/Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Plan and Organize Work**
Unit Code	**IND MCS4 12 0217**
Unit Descriptor	This unit covers the knowledge, skills and attitude required in planning and organizing work activities in a production application. It may be applied to a small independent operation or to a section of a large organization.

Elements	Performance Criteria
1. Set objectives	1.1. ***Objectives*** are planned consistent with and linked to work activities in accordance with organizational aims. 1.2. Objectives are stated as measurable targets with clear time frames. 1.3. Support and commitment of team members are reflected in the objectives. 1.4. Realistic and attainable objectives are identified.
2. Plan and schedule work activities	2.1. Tasks/work activities to be completed are identified and prioritized as directed. 2.2. Tasks/work activities are broken down into steps in accordance with set time frames and achievable components. 2.3. Task/work activities are assigned to appropriate team or individuals in accordance with agreed functions. 2.4. ***Resources*** are allocated as per requirements of the activity. 2.5. ***Schedule of work activities*** is coordinated with personnel concerned.
3. Implement work plans	3.1. ***Work methods and practices*** are identified in consultation with personnel concerned. 3.2. ***Work plans*** are implemented in accordance with set time frames, resources and ***standards***.
4. Monitor work activities	4.1. Work activities are monitored and compared with set objectives. 4.2. Work performance is monitored. 4.3. Deviations from work activities are reported and recommendations are coordinated with appropriate personnel and in accordance with set standards. 4.4. Reporting requirements are complied with in accordance with recommended format. 4.5. Timeliness of report is observed. 4.6. Files are established and maintained in accordance with standard operating procedures.

5. Review and evaluate work plans and activities	5.1. Work plans, strategies and implementation are reviewed based on accurate, relevant and current information. 5.2. Review is done based on comprehensive consultation with appropriate personnel on outcomes of work plans and reliable feedback. 5.3. Results of review are provided to concerned parties and formed as the basis for adjustments/simplifications to be made to policies, processes and activities. 5.4. Performance appraisal is conducted in accordance with organization rules and regulations. 5.5. Performance appraisal report is prepared and documented regularly as per organization requirements. 5.6. Recommendations are prepared and presented to ***appropriate personnel/authorities***. 5.7. ***Feedback mechanisms*** are implemented in line with organization policies.

Variable	**Range**
Objectives	May include, but not limited to: • Specific • General
Resources	May include, but not limited to: • Personnel • Equipment and technology • Services • Supplies and materials • Sources for accessing specialist advice • Budget
Schedule of work activities	May include, but not limited to: • Daily • Work-based • Contractual and Regular
Work methods and practices	May include, but not limited to: • Legislated regulations and codes of practice • Industry regulations and codes of practice • Occupational health and safety practices
Work plans	May include, but not limited to: • Daily work plans • Project plans • Program plans • Resource plans • Skills development plans • Management strategies and objectives
Standards	May include, but not limited to: • Performance targets

	• Performance management and evaluation systems • Occupational standards • Employment contracts • Client contracts • Discipline procedures • Workplace assessment guidelines • Internal quality assurance • Internal and external accountability and auditing requirements • Training Regulation Standards and Safety Standards
Appropriate personnel/ authorities	May include, but not limited to: • Appropriate personnel include: • Management and Line Staff
Feedback mechanisms	May include, but not limited to: • Verbal feedback • Informal feedback • Formal feedback • Questionnaire • Survey and Group discussion

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge to: • Set objectives • Plan and schedule work activities • Implement work plans • Monitor work activities • Review and evaluate work plans and activities
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Organization's strategic plan, policies rules and regulations, laws and objectives for work unit activities and priorities • Organizations policies, strategic plans, guidelines related to the role of the work unit • Team work and consultation strategies
Underpinning Skills	Demonstrates skill to: • Plan • Lead • Organize • Coordinate • Communicate • Inter-and intra-person/motivation skills • Present
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.

Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Migrate to New Technology**
Unit Code	**IND MCS4 13 0217**
Unit Descriptor	This unit defines the competence required to apply skills and knowledge in using new or upgraded technology. The rationale behind this unit emphasizes the importance of constantly reviewing work processes, skills and techniques in order to ensure that the quality of the entire business process is maintained at the highest level possible through the appropriate application of new technology. To this end, the person is typically engaged in on-going review and research in order to discover and apply new technology or techniques to improve aspects of the organization's activities.

Elements	Performance Criteria
1. Apply existing knowledge and techniques to technology and transfer	1.1. Situations are identified where existing knowledge can be used as the basis for developing new skills. 1.2. New or upgraded technology skills reacquired and used to enhance learning. 1.3. New or upgraded equipment are identified, classified and used where appropriate, for the benefit of the organization.
2. Apply functions of technology to assist in solving organizational problems	2.1. Testing of new or upgraded equipment is conducted according to the specification manual. 2.2. Features of new or upgraded equipment are applied within the organization. 2.3. Features and functions of new or upgraded equipment are used for solving organizational problems. 2.4. Sources of information relating to new or upgraded equipment are accessed and used.
3. Evaluate new or upgraded technology performance	3.1. New or upgraded equipment is evaluated for performance, usability and against OHS standards. 3.2. ***Environmental considerations*** are determined from new or upgraded equipment. 3.3. ***Feedback*** is sought from users where appropriate.

Variables	Range
Environmental Considerations	May include, but not limited to: • Recycling, safe disposal of packaging (e.g. Cardboard, polystyrene, paper, plastic) and correct disposal of waste materials by an authorized body
Feedback	May include, but not limited to: • Surveys, • Questionnaires,

	• interviews and meetings.

Evidence Guide	
Critical Aspects of Competence	Competence must confirm the ability to transfer the application of existing skills and knowledge to new technology
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • Broad awareness of current technology trends and directions in the industry (e.g. systems/procedures, services, new developments, new protocols) • Vendor product directions • Ability to locate appropriate sources of information regarding metal manufacturing and new technologies • Current industry products/services, procedures and techniques with knowledge of general features • Information gathering techniques
Underpinning Skills	Demonstrate skills of: • Research skills for identifying broad features of new technologies • Ability to assist in the decision making process • Literacy skills in regard to interpretation of technical manuals • Ability to solve known problems in a variety of situations and locations • Evaluate and apply new technology to assist in solving organizational problems • General analytical skills in relation to known problems
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Establish Quality Standards**
Unit Code	**IND MCS4 14 0217**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to establish quality specifications for work outcomes and work performance. It includes monitoring and participation in maintaining and improving quality, identifying critical control points in the production of quality output and assisting in planning and implementing of quality assurance procedures.

Elements	Performance Criteria
1. Establish quality specifications for product	1.1. Market specifications are ***sourced*** and ***legislated requirements*** identified. 1.2. Quality specifications are developed and agreed upon. 1.3. Quality specifications are documented and introduced to organization staff / personnel in accordance with the organization policy. 1.4. Quality specifications are updated when necessary.
2. Identify hazards and critical control points	2.1. Critical control points impacting on quality are identified. 2.2. Degree of risk for each hazard is determined. 2.3. Necessary documentation is accomplished in accordance with organization quality procedures
3. Assist in planning of quality assurance procedures	3.1. Procedures for each identified control point are developed to ensure optimum quality. 3.2. Hazards and risks are minimized through application of appropriate controls. 3.3. Processes are developed to monitor the effectiveness of quality assurance procedures.
4. Implement quality assurance procedures	4.1. Responsibilities for carrying out procedures are allocated to staff and contractors. 4.2. Instructions are prepared in accordance with the enterprise's quality assurance program. 4.3. Staff and contractors are given induction training on the quality assurance policy. 4.4. Staff and contractors are given in-service training relevant to their allocated ***safety procedures***.
5. Monitor quality of work outcome	2.1. Quality requirements are identified. 2.2. Inputs are inspected to confirm capability to meet quality requirements. 2.3. Work is conducted to produce required outcomes.

	2.4. Work processes are monitored to confirm quality of output and/or service. 2.5. Processes are adjusted to maintain outputs within specification.
6. Participate in maintaining and improving quality at work	6.1. Work area, materials, processes and product are routinely monitored to ensure compliance with quality requirements. 6.2. Non-conformance in inputs, process, product and/or service is identified and reported according to workplace reporting requirements. 6.3. Corrective action is taken within level of responsibility, to maintain quality standards. 6.4. Quality issues are raised with designated personnel.
7. Report problems that affect quality	7.1. Potential or existing quality problems are recognized. 7.2. Instances of variation in quality are identified from specifications or work instructions. 7.3. Variation and potential problems are reported to supervisor/manager according to enterprise guidelines.

Variable	**Range**
Sourced	May include, but not limited to: • End-users • Customers or stakeholders
Legislated requirements	May include, but not limited to: • Verification of product quality as part of consumer legislation or specific legislation related to product content or composition.
Safety procedures.	May include, but not limited to: • Use of tools and equipment for fabrication/production/ manufacturing works • Workplace environment and handling of material safety, • Following occupational health and safety procedures designated for the task • Respect the policies, regulations, legislations, rule and procedures for manufacturing/production/fabrication works

Evidence Guide	
Critical Aspect of Competence	Demonstrates skills and knowledge to: • Monitor quality of work • Establish quality specifications for product • Participate in maintaining and improving quality at work • Identify hazards and critical control points in the production of quality product • Assist in planning of quality assurance procedures • Report problems that affect quality

	• Implement quality assurance procedures
Underpinning Knowledge	Demonstrates knowledge of: • Work and product quality specifications • Quality policies and procedures • Improving quality at work • Hazards and critical points of operation • Obtaining and using information • Applying federal and regional legislation within day-today work activities • Accessing and using management systems to keep and maintain accurate records • Requirements for correct preparation and operation • Technical writing
Underpinning Skills	Demonstrates skills to: • Monitor quality of work • Establish quality specifications for product • Participate in maintaining and improving quality at work • Identify hazards and critical control points in the production of quality product • Assist in planning of quality assurance procedures • Report problems that affect quality • Implement quality assurance procedures
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Develop Individuals and Team**
Unit Code	**IND MCS4 15 0217**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to determine individual and team development needs and facilitate the development of the workgroup.

Elements	Performance Criteria
1. Provide team leadership	1.1. ***Learning and development needs*** are systematically identified and implemented in line with ***organizational requirements***. 1.2. Learning plan to meet individual and group training and developmental needs is collaboratively developed and implemented. 1.3. Individuals are encouraged to self-evaluate performance and identify areas for improvement. 1.4. ***Feedback on performance*** of team members is collected from relevant sources and compared with established team learning process.
2. Foster individual and organizational growth	2.1. Learning and development program goals and objectives are identified to match the specific knowledge and skills requirements of Competence standards. 2.2. ***Learning delivery methods*** are made appropriate to the learning goals, the learning style of participants and availability of equipment and resources. 2.3. Workplace learning opportunities and coaching/ mentoring assistance are provided to facilitate individual and team achievement of competencies. 2.4. Resources and timelines required for learning activities are identified and approved in accordance with organizational requirements.
3. Monitor and evaluate workplace learning	3.1. Feedback from individuals or teams is used to identify and implement improvements in future learning arrangements. 3.2. Outcomes and performance of individuals/teams are assessed and recorded to determine the effectiveness of development programs and the extent of additional support. 3.3. Modifications to learning plans are negotiated to improve the efficiency and effectiveness of learning. 3.4. Records and reports of competence are maintained within organizational requirement.
4. Develop team commitment and cooperation	4.1. Open communication processes to obtain and share information is used by team.

	4.2. Decisions are reached by the team in accordance with its agreed roles and responsibilities. 4.3. Mutual concern and camaraderie are developed in the team.
5. Facilitate accomplishment of organizational goals	5.1. Team members are actively participated in team activities and communication processes. 5.2. Individual and joint responsibility is developed by team's members for their actions. 5.3. Collaborative efforts are sustained to attain organizational goals.

Variable	**Range**
Learning and development needs	May include, but not limited to: • Coaching, monitoring and/or supervision • Formal/informal learning program • Internal/external training provision • Work experience/exchange/opportunities • Personal study • Career planning/development • Performance evaluation • Workplace skills assessment • Recognition of prior learning
Organizational requirements	May include, but not limited to: • Quality assurance and/or procedures manuals • Goals, objectives, plans, systems and processes • Legal and organizational policy/guidelines and requirements • Safety policies, procedures and programs • Confidentiality and security requirements • Business and performance plans • Ethical standards • Quality and continuous improvement processes and standards
Feedback on performance	May include, but not limited to: • Formal/informal performance evaluation • Obtaining feedback from supervisors and colleagues • Obtaining feedback from clients • Personal and reflective behavior strategies • Routine and organizational methods for monitoring service delivery
Learning delivery methods	May include, but not limited to: • On the job coaching or monitoring • Problem solving • Presentation/demonstration • Formal course participation

	• Work experience and involvement in professional networks • Conference and seminar attendance

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge to: • Identify and implement learning opportunities for others • Give and receive feedback constructively • Facilitate participation of individuals in the work of the team • Negotiate plans to improve the effectiveness of learning • Prepare learning plans to match skill needs • Access and designate learning opportunities
Underpinning Knowledge and Attitude	Demonstrates knowledge of: • Coaching and monitoring principles • How to work effectively with team members who have diverse work styles, aspirations, cultures and perspective • How to facilitate team development and improvement • Methods and techniques to obtain and interpreting feedback • Methods for identifying and prioritizing personal development opportunities and options • Career paths and competence standards in the industry
Underpinning Skills	Demonstrates skills to: • Read and understand a variety of texts, preparing general information and documents according to target audience; spell with accuracy; use grammar and punctuation effective relationships and conflict management • Communicate including receiving feedback and reporting, maintaining effective relationships and conflict management • Plan and organize required resources and equipment to meet learning needs • Coach and mentor skills to provide support to colleagues • Report to organize information; assess information for relevance and accuracy; identify and elaborate on learning outcomes • Facilitate and conduct small group training sessions • Relate to people from a range of social, cultural, physical and mental backgrounds
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Utilize Specialized Communication Skills**
Unit Code	**IND MCS4 16 0217**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to use specialized communication skills to meet specific needs of internal and external clients, conduct interviews, facilitate group discussions, and contribute to the development of communication strategies.

Elements	Performance Criteria
1. Meet common and specific communication needs of clients and colleagues	1.1. Specific communication needs of clients and colleagues are identified and met. 1.2. Different approaches are used to meet communication needs of clients and colleagues. 1.3. Conflict is addressed promptly and in a timely way and in a manner which does not compromise the standing of the organization.
2. Contribute to the development of communication strategies	2.1. ***Strategies*** for internal and external dissemination of information are developed, promoted, implemented and reviewed as required. 2.2. Channels of communication are established and reviewed regularly. 2.3. Coaching in effective communication is provided 2.4. Work related network and relationship are maintained as necessary. 2.5. Negotiation and conflict resolution strategies are used where required. 2.6. Communication with clients and colleagues is made appropriate to individual needs and organizational objectives.
3. Represent the organization	3.1. When participating in internal or external fora, presentation is relevant, appropriately researched and presented in a manner to promote the organization. 3.2. Presentation is made clear and sequential and delivered within a predetermined time. 3.3. Appropriate media is utilized to enhance presentation. 3.4. Differences in views are respected. 3.5. Written communication is made consistent with organizational standards. 3.6. Inquiries are responded in a manner consistent with organizational standard.

4. Facilitate group discussion	4.1. Mechanisms which enhance ***effective group interaction*** are defined and implemented. 4.2. Strategies which encourage all group members to participate are used routinely. 4.3. Objectives and agenda are routinely set and followed for meetings and discussions. 4.4. Relevant information are provided to group to facilitate outcomes. 4.5. Evaluation of group communication strategies is undertaken to promote participation of all parties. 4.6. Specific communication needs of individuals are identified and addressed.
5. Conduct interview	5.1. A range of appropriate communication strategies are employed in ***interview situations***. 5.2. Different ***types of interview*** is conducted in accordance with the organizational procedures. 5.3. Records of interviews are made and maintained in accordance with organizational procedures. 5.4. Effective questioning, listening and nonverbal communication techniques are used to ensure that required message is communicated.

Variable	**Range**
Strategies	May include, but not limited to: • Recognizing own limitations • Utilizing techniques and aids • Providing written drafts • Verbal and non verbal communication
Effective group interaction	May include, but not limited to: • Identifying and evaluating what is occurring within an interaction in a non-judgmental 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
Interview situations	May include, but not limited to: • Establish rapport • obtain facts and information • Facilitate resolution of issues • Develop action plans • Diffuse potentially difficult situation

Types of Interview	May include, but not limited to: • Related to staff issues • Routine • Confidential • Evidential • Non-disclosure • Disclosure

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge to: • Demonstrate effective communication skills with clients and work colleagues accessing service • Adopt relevant communication techniques and strategies to meet client particular needs and difficulties
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Communication process • Dynamics of groups and different styles of group leadership • Communication skills relevant to client groups
Underpinning Skills	Demonstrates skills to: • Full range of communication techniques including: ➢ active listening ➢ feedback ➢ interpretation ➢ role boundaries setting ➢ negotiation ➢ establishing empathy ➢ communication strategies • Communicate to fulfil job roles as specified by the organization
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Manage Micro, Small and Medium Enterprises (MSMEs)**
Unit Code	**IND MCS4 17 0217**
Unit Descriptor	This unit covers knowledge, skills and attitude required in running Micro, Small and Medium enterprises. The strategies involve developing, monitoring and managing work activities and financial information, developing effective work habits, and adjusting work schedules as needed.

Elements	Performance Criteria
1. Develop and communicate Strategic work plan	1.1. The importance of planning is sensitized before acting and about the importance of plans to reduce risks and to inhibit impulsive actions and discussed. 1.2. The basics of planning and beginning with goal setting are communicated. 1.3. The achievement of measurable and realistic short-term business objective is addressed. 1.4. How to develop realistic activities plans and schedule is discussed. 1.5. ***Major components of work plan*** are introduced and understood. 1.6. The importance of constant reviewing their plans is understood by monitoring the results.
2. Identify daily work requirements and Develop effective work habits	2.1. Basic concept about effect working culture is discussed and understood. 2.2. Different approaches to work culture are developed and understood. 2.3. Work requirements are identified for a given time period by taking into consideration of ***resources*** and constraints. 2.4. Work activities are prioritized based on business needs, requirements and deadlines. 2.5. If appropriate, work is allocated to relevant staff or contractors to optimize efficiency. 2.6. Work and personal priorities are identified and a balance is achieved between competing priorities using appropriate ***time management strategies***. 2.7. Input is sought from ***internal and external sources*** and used to develop and refine new ideas and approaches. 2.8. Business or inquiries is/are responded to promptly and effectively. 2.9. Information is presented in a format appropriate to the industry and audience.

3. Manage Marketing of MSMEs	3.1. Information on market and business needs is analyzed and market opportunities identified. 3.2. Marketing mix and components are evaluated. 3.3. Marketing mix for specific target market is determined. 3.4. Marketing mix is monitored and continual adjusted against marketing performance.
4. Manage Human Resources	4.1. ***Human resource rules, regulations law and procedures*** are identified and determined. 4.2. The existing human resource is audited, and gaps are identified. 4.3. Recruitment and selection are conducted based on the organizational requirements. 4.4. Selected candidates are oriented and placed for the appropriate position. 4.5. Appraisal of employees' performance is conducted. 4.6. Appraisal result is used for training and development, promotion, compensation, disciplinary measures and other purposes as required. 4.7. ***Employee relations*** are maintained.
5. Manage production and Operation	5.1. Production /operation plan is developed and implemented. 5.2. Required inputs are purchased and adequate inventories maintained. 5.3. Production /operation process is checked and controlled. 5.4. Quality control is applied and maintained.
6. Maintain financial records and use for decision making	6.1. The objective and benefits of financial records are discussed and understood. 6.2. Asset, liabilities and capital are identified and recorded. 6.3. Balance sheet and different journals are discussed. 6.4. Business transactions are discussed, analyzed, classified and recorded. 6.5. Daily financial records are maintained correctly in accordance with legal and accounting requirements. 6.6. Invoices and payments are prepared and distributed in timely manner and in accordance with legal requirements. 6.7. Outstanding accounts are collected or followed-up. 6.8. Revenue, expense and costs are identified and discussed. 6.9. Different ledgers and subsidiary ledgers are discussed and maintained.

	6.10. Profit and loss report is prepared. 6.11. Financial interpretation is conducted with assistant from the appropriate person. 6.12. Financial manual is prepared.
7. Monitor, Manage and Evaluate work performance	7.1. People, resources and/or equipment are coordinated to provide optimum results. 7.2. Staff, clients and/or contractors are communicated within a clear and regular manner, to monitor work in relation to ***business goals*** or timelines. 7.3. ***Problem solving techniques*** are applied to work situations to overcome difficulties and achieve positive outcomes. 7.4. Opportunities for improvements are monitored according to business demands. 7.5. Work schedules are adjusted to incorporate necessary modifications to existing work and routines or changing needs and requirements. 7.6. Proposed changes are clearly communicated and recorded to aid in future planning and evaluation. 7.7. Relevant codes of practice are used to guide an ethical approach to workplace practices and decisions.

Variable	**Range**
Major components of work plan	May include, but not limited to: • Objective • Responsibilities • Resources (human, materials, finance, time, etc) • Activities
Resources	May include, but not limited to: • Human resource • Money • Time • Machines • Equipment • Space
Time management strategies	May include, but not limited to: • Prioritizing and anticipating • Short term and long term planning and scheduling • Creating a positive and organized work environment • Clear timelines and goal setting that is regularly reviewed and adjusted as necessary • Breaking large tasks into smaller tasks • Getting additional support if identified and necessary

Internal and external sources	May include, but not limited to: • Staff and colleagues • Management, supervisors, advisors or head office • Relevant professionals such as lawyers, accountants, management consultants • Professional associations
Human resource rules , regulations law and procedures	May include, but not limited to: • Recruitment and selection • Orientation and placement • Training and development • Performance appraisal and reward system • Disciplinary procedures • Movement and separation • Industrial relation
Employee relations	May include, but not limited to: • Relationship within employees • Relationship among employees and management and labor union • Relationship between labor union and government
Business goals	May include, but not limited to: • Sales targets • Budgetary targets • Team and individual goals • Production targets • Reporting deadlines
Problem solving techniques	May include, but not limited to: • Brainstorming • Fish bone • Focus group discussion and Problem tree

Evidence Guide	
Critical Aspects of Competence	A person must be able to demonstrate: • Ability to identify daily work requirements and allocate work appropriately • Ability to interpret financial documents in accordance with legal requirements • The ability to prepare strategic plan • The ability to develop effective work habit • The ability to manage marketing of MSEs • The ability to manage human resources of MSEs • the ability to manage production/operation of MSEs • The ability to maintain financial records of MSEs • The ability to manage, monitor and evaluate work performance of MSMEs
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • Strategic plan • Working culture

	• Time management strategy • Marketing Mix • Relevant marketing, operation/production, human resource and financial management • Human resource functions • Production/operation functions • Monitoring and evaluation • Problem solving techniques • Federal and Local Government legislative requirements affecting business operations, especially in regard to OHS, equal employment opportunity, industrial relations and anti-discrimination • Relevant industry code of practice • Planning techniques to establish realistic timelines and priorities • Identification of relevant performance measures • Quality assurance principles and methods
Underpinning Skills	Demonstrate skills to: • Technical or specialist skills relevant to the business operation • Interpret legal requirements, company policies and procedures and immediate, day-to-day demands • Strategic planning skills • Human relation skills • Communicate using questioning, clarifying, reporting, and giving and receiving constructive feedback • Numeracy skills for performance information, setting targets and interpreting financial documents and reports • Technical skills to interpret business document, reports and financial statements and projections • Relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities • Solve problem and develop contingency plans • Using computers and software packages to record and manage data and to produce reports • Evaluate using assessment work and outcomes • Observe for identifying appropriate people, resources and to monitor work
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Mechanics Supervision Level IV	
Unit Title	**Apply Problem Solving Techniques and Tools**
Unit Code	**IND MCS4 18 0217**
Unit Descriptor	This unit of competency covers the knowledge, skills and attitude required to apply scientific problem solving techniques and tools to enhance quality, productivity and other kaizen elements on continual basis.

Elements	Performance criteria
1. Identify and select theme/problem.	1.1. ***Safety requirements*** are followed in accordance with safety plans and procedures. 1.2. All possible problems related to the process /Kaizen elements are listed using ***statistical tools and techniques***. 1.3. All possible problems related to kaizen elements are identified and listed on Visual Management Board/Kaizen Board. 1.4. Problems are classified based on obviousness of cause and action. 1.5. Critical factors like the number of customers affected, Potentials for bottlenecks, and number of complaints etc… is selected. 1.6. Problems related to priorities of ***Kaizen Elements*** are given due emphasis and selected.
2. Grasp current status and set goal.	2.1. The extent of the problem is defined. 2.2. Appropriate and achievable goal is set.
3. Establish activity plan.	3.1. The problem is confirmed. 3.2. High priority problem is selected. 3.3. The extent of the problem is defined. 3.4. Activity plan is established as per ***5W1H***.
4. Analyze causes of a problem.	4.1. All possible causes of a problem are listed. 4.2. Cause relationships are analyzed using***4M1E***. 4.3. Causes of the problems are identified. 4.4. Root causes are selected. 4.5. The root cause which is most directly related to the problem is selected. 4.6. All possible ways are listed using ***creative idea generation*** to eliminate the most critical root cause. 4.7. The suggested solutions are carefully tested and evaluated for potential complications.

	4.8. Detailed summaries of the action plan are prepared to implement the suggested solution.
5. Examine countermeasures and their implementation.	5.1. Action plan is implemented by ***medium KPT*** members. 5.2. Implementation is monitored according to the agreed procedure and activities are checked with preset plan.
6. Assess effectiveness of the solution.	6.1. ***Tangible and intangible results*** are identified. 6.2. The results are verified over time. 6.3. Tangible results are compared with targets using ***various types of diagram***.
7. Standardize and sustain operation.	7.1. If the goal is achieved, the new procedures are standardized and made part of daily activities. 7.2. All employees are trained on the new ***Standard Operating Procedures (SOPs)***. 7.3. SOP is verified and followed by all employees. 7.4. The next problem is selected to be tackled by the team.

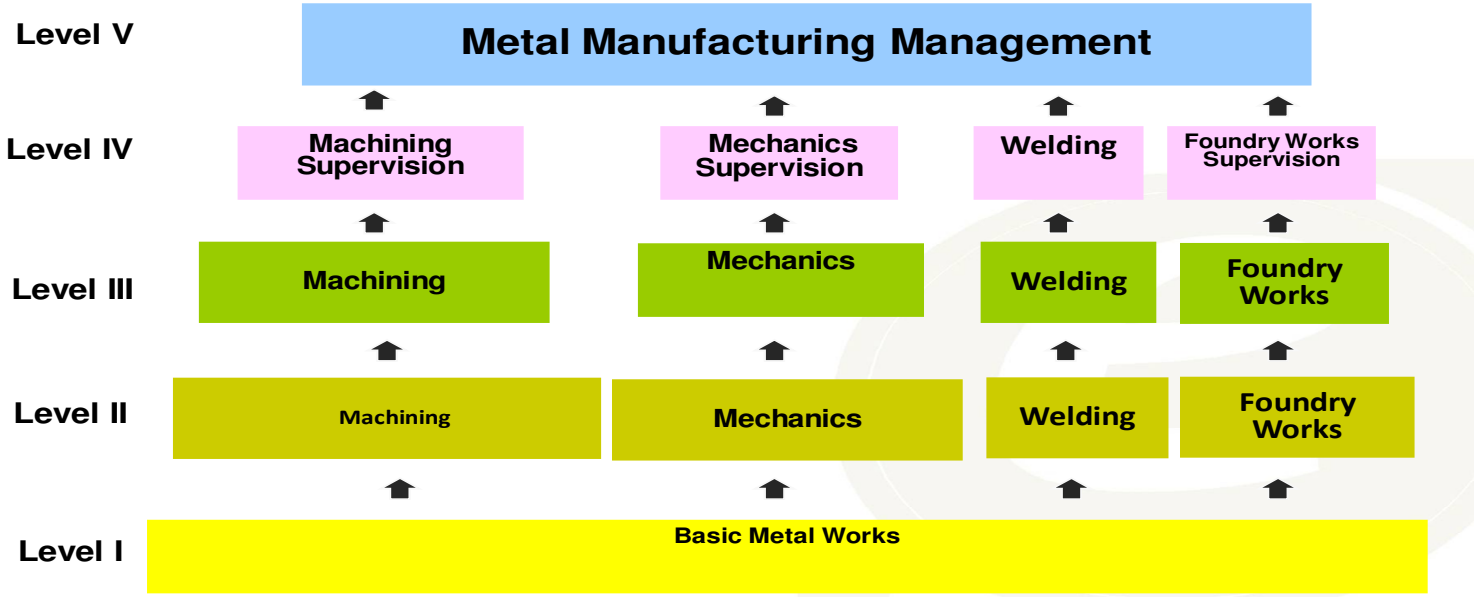
Variables	**Range**
Safety requirements	May include, but not limited to: • OHS requirements include legislation, material safety, managements system, hazardous substances and dangerous goods code and local safe operating procedures • Work is carried out in accordance with legislative obligations, environmental legislations, relevant health regulation, manual handling procedure and organization insurance requirements
Statistical tools and techniques	May include, but not limited to: • 7 QC tools may include: ➢ Stratification ➢ Pareto Diagram ➢ Cause and Effect Diagram ➢ Check Sheet ➢ Control Chart/Graph ➢ Histogram and Scatter Diagram • QC techniques may include: ➢ Brain storming ➢ Why analysis ➢ What if analysis ➢ 5W1H
Kaizen Elements	May include, but not limited to: • Quality • Cost • Productivity • Delivery

	• Safety • Moral • Environment and Gender equality
5W1H	May include, but not limited to: • Who: person in charge • Why: objective • What: item to be implemented • Where: location • When: time frame • How: method
4M1E	May include, but not limited to: • Man • Machine • Method • Material and Environment
Creative idea generation	May include, but not limited to: • Brainstorming • Exploring and examining ideas in varied ways • Elaborating and extrapolating • Conceptualizing
Medium KPT	May include, but not limited to: • 5S • 4M (Machine, Method, Material and Man) • 4p (Policy, Procedures, People and Plant) • PDCA cycle • Basics of IE tools and techniques
Tangible and intangible results	May include, but not limited to: • Tangible result may include quantifiable data • Intangible result may include qualitative data
Various types of diagram	May include, but not limited to: • Line graph • Bar graph • Pie-chart • Scatter and Affinity diagrams
Standard Operating Procedures (SOPs)	May include, but not limited to: • The customer demand • The most efficient work routine (steps) • The cycle times required to complete work elements • All process quality checks required to minimize defects/errors • The exact amount of work in process required

Evidence Guide	
Critical Aspects of Assessment	Demonstrates skills and knowledge competencies to: • Apply all relevant procedures and regulatory requirements to ensure quality and productivity of an organization. • Detect non-conforming products/services in the work area

	• Apply effective problem solving approaches/strategies. • Implement and monitor improved practices and procedures • Apply statistical quality control tools and techniques.
Underpinning Knowledge and Attitude	Demonstrates knowledge of: • QC story/PDCA cycle/ • QC story/ Problem solving steps • QCC techniques • 7 QC tools • Basic IE tools and techniques. • SOP • Quality requirements associated with the individual's job function and/or work area • Workplace procedures associated with the candidate's regular technical duties • Relevant health, safety and environment requirements • organizational structure of the enterprise • Lines of communication • Methods of making/recommending improvements. • Reporting procedures
Underpinning Skills	Demonstrates skills to: • Apply problem solving techniques and tools • Apply statistical analysis tools • Apply Visual Management Board/Kaizen Board. • Detect non-conforming products or services in the work area • Document and report information about quality, productivity and other kaizen elements. • Contribute effectively within a team to recognize and recommend improvements in quality, productivity and other kaizen elements. • Implement and monitor improved practices and procedures. • Organize and prioritize activities and items. • Read and interpret documents describing procedures • Record activities and results against templates and other prescribed formats.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

METALS MANUFACTURING



Acknowledgement

We wish to extend thanks and appreciation to the many representatives of business, industry, academe and government agencies who donated their time and expertise to the development of this occupational standard.

We would like also to express our appreciation to the Experts of GIZ, Techtra Engineering, Steely RMI P.L.C., Walia Steel Industry, Akaki Metal Products Factory, Akaki Spare Parts, Holland Car P.L.C., B and C Aluminum P.L.C./Inter Africa Extrusion, Zukuala Steel Production Factory, Mesfin Industrial Engineering P.L.C., Kaliti Metal Production Factory, Metal Corporation, Metals Industry Development Institute, Ministry of Trade and Industry; and Federal Technical and Vocational Education and Training (TVET) who made the development of this occupational standard possible.

This occupational standard was developed on February 2017 at Addis Ababa, Ethiopia.