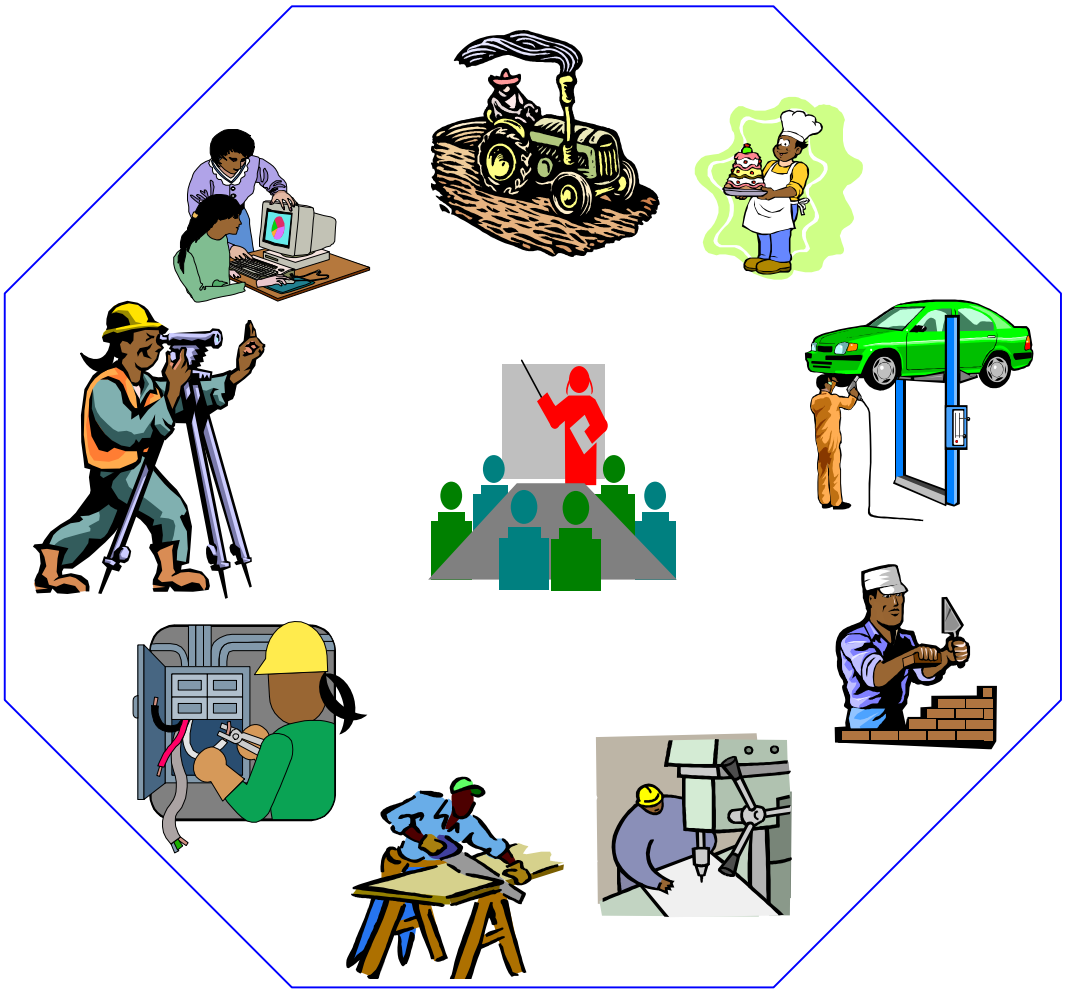
Federal Democratic Republic of Ethiopia

OCCUPATIONAL STANDARD

INDUSTRIAL ELECTRICAL MACHINES AND DRIVES SERVICING

NTQF Level II



Ministry of Education

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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 Ethiopia 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 code
- Unit title
- 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 occupation with all the key components of a Unit of Competence:

- chart with an overview of all Units of Competence for the respective level including the Unit Codes and the Unit Titles
- 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: Industrial Electrical Machines and Drives Servicing

Occupational Code: EEL EMD

NTQF Level II

EEL EMD2 01 0511 Install and Terminate Wiring System	EEL EMD2 02 0511 Perform Installation of Motor Controller System	EEL EMD2 03 0511 Perform Installation Works
EEL EMD2 04 0511 Maintain and Repair Industrial Electrical Machines and Drives	EEL EMD2 05 0511 Diagnose and Rectify Fault in Motor Drive System	EEL EMD2 06 0511 Perform Commissioning of Electrical Equipment/System
EEL EMD2 07 0511 Participate in Workplace Communication	EEL EMD2 08 0511 Work in Team Environment	EEL EMD2 09 0511 Develop Business Practice
EEL EMD2 10 0511 Maintain an Effective Relationship with Client/Customers	EEL EMD2 11 1012 Apply Continuous Improvement Processes (Kaizen)	

TOP

Occupational Standard: Industrial Electrical Machines and Drives Servicing	
Unit Title	**Install and Terminate Wiring System**
Unit Code	**EEL EMD2 01 0511**
Unit Descriptor	This unit of competency describes the skills, attitude and knowledge required in electrical installation and terminating wiring system.

Elements	Performance Criteria
1. Plan and prepare	1.1 Installation is planned and prepared to ensure OH&S policies and procedures are followed, the work is appropriately sequenced in accordance with requirements 1.2 Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site 1.3 Wiring systems' components are checked against job requirements 1.4 Fitting Accessories are obtained in accordance with established procedures and to comply with requirements 1.5 Location in which specific items of accessories, apparatus and circuits are to be installed is determined from job requirements 1.6 Materials necessary to complete the work are obtained in accordance with established procedures and checked against job requirement 1.7 Tools, equipment and testing devices needed to carry out the installation work are obtained in accordance with established procedures and checked for correct operation and safety 1.8 Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements
2. Perform installation and termination of wiring system	2.1 OH&S policies and procedures for installing electrical wiring systems are followed 2.2 Wiring systems are installed in accordance with requirements, without damage or distortion to the

	surrounding environment or services 2.3 Accessories are terminated and connected in accordance with requirements 2.4 Unplanned events or conditions are responded to in accordance with established procedures 2.5 Approval is obtained in accordance with established procedures from appropriate personnel before any contingencies are implemented
3. Inspect and notify completion of work	3.1 Final inspections are undertaken to ensure the installed apparatus conforms to requirements 3.2 Work completion is notified in accordance
4.Clean up	4.1 Work area is cleared and materials disposed of, reused or recycled in accordance with legislation/regulations/codes of practice and job specification 4.2 Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices 4.3 Return Surplus materials to warehouse

Variables	**Range**
Tools and Equipment	May Include but not limited to: • pipe cutter • ream • bend • off-set • thread • drill • Solder • Multimeter

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • Performed installation and termination of wiring system • Understand the complexity of an electric

	installation
Underpinning Knowledge and Attitudes	• Use of correct testing methods • The requirements of an inspection with regard to: selection, identification and connection of conductors - protection against contact and fire - labeling, access to switchgear and equipment • knowledge of danger, warning notices, diagrams and instructions • Testing that takes place under live conditions • The principles of electrical theory for the inspection, testing and terminating of electrical wiring systems and equipment • Types, their advantages and limitations of different electrical connections • Establishing which connections in circuits and protective conductors including connections to terminals are suitable for the purpose for which they are being used • The implications on the choice of connections with regard to permanent or temporary purposes • Requirements of joints and connections to be of strength and conductance to allow for the passage of fault currents and to prevent corrosion
Underpinning Skills	• Correct test and proving instruments selected • Choosing the right instruments for the test • Best practice with regard to methods of testing, their inter-relationship and sequence • The approved procedures and requirements for terminating the installation • approved reporting procedures • Carrying out the tests and the effect on equipment not part of the fixed installation • Interpreting diagrams and drawings to facilitate the connection of wiring systems, wiring enclosures and equipment • The procedures for proving a connection is electrically and mechanically sound

Resources Implication	The following resources must be provided • Workplace location • Tools and equipment appropriate to assembly of electrical control system • Materials relevant to the activity:Wiring diagrams, layout/shop drawings and specifications relevant to the task
Methods of Assessment	Competency may be assessed through: • Interview/Written Test • Demonstration/Observation with Oral Questioning
Context of Assessment	Competency may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Industrial Electrical Machines and Drives Servicing Level II	
Unit Title	**Perform Installation of Motor Controller System**
Unit Code	**EEL EMD2 02 0511**
Unit Descriptor	This unit covers the knowledge, attitudes and skills in performing installation of motor controller and electrical wiring system

Elements	Performance Criteria
1. Plan and Prepare for Motor controller Installation	1.1 ***Wiring diagrams*** and layout/shop drawings are obtained according to job requirements 1.2 Drawings are read and interpreted in accordance with job requirements 1.3 Estimated work schedule is verified with immediate superior 1.4 Correct rating, quantity, sizes and type of control ***components & wiring devices*** and other materials are identified in line with job requirements 1.5 Correct size and degree of protection of enclosures are verified in line with job requirements 1.6 ***Tools and testing instruments*** are properly selected in line with job requirements 1.7 Correct PPE are identified and selected in line with safety requirements 1.8 Submit complete data on inspection report based on job requirements to immediate superior.
2. Request materials, tools and equipment	2.1 Quantity, usage and specifications of materials, tools and equipment are verified according to job requirements 2.2 Requisition form is properly filled-up according to list of materials, tools and equipment prepared 2.3 Requisition forms are approved by immediate superior
3. Inspect electrical materials and tools	3.1 Delivered materials are checked/inspected/ tested according to quantity, usage and specifications 3.2 Defective/Sub-standard electrical materials are identified according to physical damaged and quality are reported to immediate superior 3.3 Defective/sub-standard/wrong specification electrical materials are returned to warehouseman/stockman for replacement 3.4 Submit inspection reports on deliveries of electrical materials and tools to immediate superior.
4. Assemble	4.1 Safety procedures are followed according to enterprise,

electrical motor controller	government and manufacturers regulations 4.2 Electrical components and wiring devices are laid-out, mounted or installed according to drawings, plans, specifications and standards 4.3 Electrical control components are wired correctly in accordance with wiring diagrams and standards 4.4 Work schedule is followed to ensure job is completed on time in accordance to a quality standard and minimum wastage. 4.5 Further instructions are sought from the immediate superior in case of unplanned events or conditions occurring. 4.6 On going checks of quality of the work are undertaken with strict compliance in accordance with instructions and requirements. 4.7 Preliminary checks/tests are conducted in line with job requirements.
5. Notify completion of work	5.1 Immediate superior is notified upon completion of work. 5.2 Performance tests are made to ensure that work conforms to instructions and job requirements. 5.3
6. Clean-Up	6.1 Work area is cleared and materials disposed of, reused or recycled in accordance with legislation/regulations/codes of practice and job specification 6.2 Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices 6.3 Return Surplus materials to warehouse

Variable	**Range**
Wiring diagrams	include but are not limited to: • Power circuit • Control circuit • Indicating circuit
Control components & wiring devices	include but are not limited to: • Circuit breakers/Fuses • Magnetic Contactors • Relays • Power Cabinet • Timers • Terminal Blocks/Lugs • Pilot lamps • Push buttons

	• Selector Switches. • Cable duct • Din rail • Wire strap • Wire markers • Cable tie • Cable gland • Conductors • Insulators
Degree of Protection	• Nema Standards • EBC Standards
Tools & Testing Instruments	include but are not limited to: • Tools o Pliers o Screw drivers o Wrenches o Wire strippers o Electrician knives o Electric Hand drill o Hand or electric taping/threading o Hack saw o Manual/Hydraulic puncher o Measuring tools (e.g. Push-pull meter) o Crimping tools o Soldering tools • Testing Instruments o Multi-meter o Clamp ammeter o Insulation resistance tester(Megger) o Ground resistance tester o Earth leakage tester o Tachometer o Phase Sequence Tester
Personal protective equipment (PPE)	include but are not limited to: • Proper working clothes • Working gloves • Safety shoes • Gas/Dust mask • Hard hat • Safety goggles

Specifications	• Brand/Make
	  o Classification/Type
	• Rating
	  o Voltage
	  o Current
	  o Power
	  o Frequency
	  o Temperature Rise
	  o Service factor
	  o Utilization category
	• Phase
	• Needed accessories

Preliminary Check/Tests	include but are not limited to:
	• Mechanical
	  o Board/Panel properly leveled
	  o Tightness of bolts and nuts
	  o Type of protection
	  o Cleanliness
	  o Cable trays
	• Electrical
	  o Conductor size or Cross-section
	  o Conductor Color Coding
	  o Cables laid to avoid risk of short circuit
	  o Grounded circuit
	  o Short circuit
	  o Open circuit
	  o Insulation Test
	  o Continuity Test/Contact Resistance Test
	  o Correct use of wire markers & terminals

Performance Tests	• Simulation Test/No Load Test • Phase sequence • Actual Operation • Temperature rise

Evidence guide

Critical aspects of competency	Assessment requires evidence that the candidate: • Demonstrated understanding/interpretation on diagrams, symbols and work instructions • Demonstrated understanding of proper use of materials, tools and testing instruments for assembly of electrical control system • Selected and used correct personal protective equipment • Demonstrated correct procedures for installation and wiring of electrical control components • Demonstrated understanding on proper testing procedures • Followed work schedule • Demonstrated good work attitude
Underpinning Knowledge	Include but not limited to: 2.1Materials use and specification 2.2 Economic use of materials 2.3 Safe working habits/Safety procedures 2.4 EBCS requirements 2.5 Electrical control components and devices 2.6 Correct procedures in assembling electrical control system 2.7 Measurement 2.8 Cleaning of worksite, tools and equipment
Underpinning Skills	diagrams and work instructions correctly • Verifying materials, tools and testing instruments • Following wiring diagrams • Following safety procedures • Proper handling of materials • Proper using of hand-tools • Splicing of conductors • Dressing/harnessing of wires • Terminating and insulating of wires • Storing excess materials • Checking quality of work • Communicating skills (both written and oral) • Measuring techniques/skills • Estimating quantity/bill of materials • Preparing request forms for supplies/materials/tools and equipment

Resource Implications	The following resources should be provided: • Workplace location • Tools and equipment appropriate to assembly of electrical control system • Materials relevant to the activity • Wiring diagrams, layout/shop drawings and specifications relevant to the task
Assessment Methods	Competency may be assessed through: • Interview / questioning / written test • Simulation/demonstration / Observation
Context of Assessment	Competency may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Industrial Electrical Machines and Drives Servicing Level II	
Unit Title	**Perform Installation Works**
Unit code	**EEL EMD2 03 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes necessary to install the electrical machines and drives.

Elements	Performance criteria
1. Plan and prepare for installation	1.1 Work instructions are read and interpreted to determine job requirements. 1.2 Tools and testing devices needed to carry out the installation work are selected in accordance with established procedures and checked for correct operation and safety. 1.3 Materials necessary to complete the work are obtained in accordance with job requirements.
2. Install electrical machines and drives	2.1 Appropriate ***personal protective equipment*** is worn in line with standard operating procedures. 2.2 OH & S policies and procedures for installation are followed in line with the job requirements. 2.3 Electrical machines and drives are installed in accordance with manufacturer's instructions, requirements, and without damage to the surrounding place or environment 2.4 Unplanned events or conditions are responded to in accordance with established procedures
3. Test installed electrical machines and drives	3.1 Electrical machines and drives are tested in accordance with manufacturer's instruction 3.2 Final inspections are undertaken to ensure that the installed electrical machines and drives conform to manufacturer's instruction. 3.3 Report on installation and testing of equipment is prepared according to company's procedures/policies.
4 Clean-up	4.1 Work site is cleaned and cleared of all debris and left safe in accordance with the company requirement

Variable	Range
Tools	Include the following but not limited to: • Pliers; assorted • Screwdrivers; assorted

	• Wrenches; assorted
Test equipment/ instruments	Include the following but not limited to: • Electrical hand tools (pliers, screwdrivers, wrenches, wires, splicer, knife, wire stripper) • Multi-testers, mega-ohmmeter, clamp ammeter • Tachometer • Pressure gauge • Industrial thermometer • Frequency meter • Flow meters • Lux meters • Multi-tester
Materials	Include the following but not limited to: • Wires • Terminal lugs • Terminal blocks • Terminal wire marker • Tubing • Tube fittings • Teflon sealant
Personal protective equipment	Include the following but not limited to: • Safety hat • Safety shoes • Ear muffs • Goggles • Safety belt/Harness • Gloves • Mask
OH & S policies and procedures	• OH & S guidelines • Ethiopian environmental standards
Electrical machines and drives devices	Include the following but not limited to: • Analogue devices o Actuators o Servo & Stepper Motors o Frequency drives o Transducers o Transmitters • Digital devices o Actuators

	o Buzzers o Indicating Lamps o Limit switches o Magnetic contactors o Photo-sensors o Proximity sensors o Solenoid Cylinders o Directional solenoid valves

Evidence guide	
Critical aspect of competency	Assessment requires evidence that the candidate: • Correctly interpreted work instructions • Selected appropriate tools, testing instruments and materials for electrical wiring installation • Selected and used correct personal protective equipment • Followed criteria for installation and wiring of electrical devices, auxiliary and protection system equipment • Followed safety procedures • Undertaken checks of quality of the work in accordance with instructions and job requirements • Followed EBCS regulations • Demonstrated good working attitudes
Underpinning knowledge	• Materials use and specification • Understand economic use of material • Safe working procedures (including works in hazardous locations) • Ethiopian Building Code standards (EBCS) requirements • Correct procedures in installing electrical wiring • Installation of communication/paging system • Kinds of lighting fixtures and its application • Basic Electronics • Motor Controllers • Motors and Generators • Power Calculation • Time Management • Measurement • Pneumatics / electro-pneumatics • Basic Computer operations

Underpinning skills	• Interpreting plan and details • Planning and coordinating work scheduling • Able in determining and classifying work environment • Preparing materials • Proper using of hand tools • Splicing conductors • Dressing/harnessing of wires and Terminating wires • Crimping/ Soldering wires and connectors • Storing excess materials properly • Cleaning worksite, tools and equipment • Installing electrical wiring materials, equipment and accessories • Operating computer
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.
Assessment Methods	Competency may be assessed through: • Interview / questioning / written test • Simulation/demonstration / Observation
Context of Assessment	Competency may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Industrial Electrical Machines and Drives Servicing Level III	
Unit Title	**Maintain and Repair Industrial Electrical Machines and Drives**
Unit Code	**EEL EMD2 04 0511**
Unit Descriptor	This unit covers the knowledge, attitudes and skills needed in performing maintenance, troubleshooting and repair works on industrial electrical machines and drives.

Elements	Performance Criteria
1. Plan, prepare and coordinate maintenance works	1.1 ***Maintenance work*** schedule is prepared in accordance with machine/equipment operating time/condition 1.2 Work instructions are prepared according to machine's manual and established enterprise procedures 1.3 Materials, tools, equipment, testing devices and PPE needed to complete job requirements are identified and requested/obtained in line with prepared work instructions 1.4 Potential hazards are identified for prevention and control measures are selected in accordance with the work plan and site procedures 1.5 Safety permit/Hot work permit is secured in accordance with enterprise procedure. 1.6 Concerned department/personnel are informed on the schedule of work according to standard operating procedure.
2. Maintain electrical system or equipment	2.1 Safety policies and procedures are followed in accordance with OH&S and enterprise procedure 2.2 Electrical system or equipment parts are properly tested/ cleaned/lubricated according to manufacturer or enterprise procedure. 2.3 Worn-out/malfunctioning electrical system or equipment parts are identified and replaced in accordance with manufacturer's requirements or enterprise standards 2.4 Readings of Electrical measuring instruments are checked and identified defective instruments are referred for calibration/replacement in accordance with enterprise procedure. 2.5 Connectors, bolts, nuts and screws are checked and tightened according to sizes and torque requirements

	2.6 Routine/visual/sensory inspection is regularly conducted in line with normal operation 2.7 Unforeseen events are responded in line with established procedures 2.8 Ongoing check of quality and progress of works are undertaken with strict compliance in line with established procedures.
3. Troubleshoot faults in an Electrical System or equipment	3.1 Safety policies and procedures are followed 3.2 Availability of maintenance records are prepared in accordance with established procedure, or based on enterprise Quality Management System (QMS). 3.3 Circuit or equipment to be diagnosed is isolated (lockout/tag-out) in accordance with established procedure or according to suitable accepted standard practices. 3.4 Indicators/Symptoms of fault or failure are identified. 3.5 Necessary electrical test on the system or equipment is performed in accordance with established procedure or according to manufacturer's guidelines. 3.6 Extent of the fault to include the time to accomplish the job and the spare parts needed is estimated according to extent of damage. 3.7 Other works associated with the problem are coordinated with other concerned group. 3.8 Details of fault, possible cause, corrective action, recommendation to eliminate the problem are recorded accordingly. 3.9 Unforeseen events are responded in line with established procedures
4. Notify completion of work	4.1 Immediate superior is notified upon completion of work. 4.2 Performance tests are made to ensure that work conforms to instructions and job requirements. 4.3 Service report is prepared and submitted to appropriate officer
5.Clean-up	5.1 Tools, equipment and any surplus materials are cleaned, checked and returned to storage area in accordance with established procedures. 5.2 Work area is cleaned up and made safe in accordance with OH&S requirements

Variable	Range
Maintenance work	• Preventive • Corrective/Breakdown • Routine • Predictive • Condition based
Materials	May include but not limited to: • Contact cleaner • Insulating varnish/materials • Carbon brushes • Sand paper • Waste rugs • Electrical tapes • Warning tags • Signage • Lockout/tag-out • Lubricants • Motor cleaner • Insulating oil • Coolant
Tools, equipment and testing devices	Including but not limited to: • Electrical hand tools o Pliers o Screwdrivers o Wrenches o Wire splicer o Knives o Bolt/Cable cutter o Knockout puncher o Torque wrench • Testing instruments/devices o Multi-tester (VOM) o Insulation resistance tester (Megger) o High potential tester o Low resistance tester o Phase sequence meter o Ammeter o Torque meter • Equipment o Labeling machine o Vacuum cleaner

	○ Air blower and Dryer ○ Welding machine ○ Pressure washer ○ Vacuum pump
Personal protective equipment (PPE)	Including but not limited to: • Working gloves • Safety shoes • Hard hat • Face shield • Insulating mat • Lockout tags • Safety goggles • Safety belt • Safety ladder
Potential hazards	Including but not limited to: • Live wires • Oil spill • Chemical hazards • Flammable materials • Sources of energy • Moving machine parts • Sharp/pointed objects • Noise hazards
Electrical system or equipment parts	include but not limited to: • Electrical ○ Carbon brushes ○ Brush holders ○ Slip ring ○ Commutators ○ Contactors ○ Relays ○ Circuit breakers ○ Wires ○ Timers ○ Switches and push buttons ○ Indicating lamps ○ Terminal blocks ○ Sensors • Mechanical ○ Bearings ○ Bushings ○ Shafting

	o Filters o Bolts and nuts o Belts o Pulley o Couplings o Gears
Electrical measuring instruments	include but are not limited to: • Multi-meter (VOM/DMM) • Insulation resistance tester (Megger) • High potential tester • Low resistance tester • Phase sequence meter • Ammeter
Maintenance records	include but are not limited to: • Electrical plans • Equipment electrical diagrams • Historical records o Job orders o Commissioning test record o Preventive Maintenance schedules o Corrective Maintenance records o Manufacturer's maintenance guides o Equipment breakdown records o Periodic monitoring data o Service reports • Log book
Quality Management System	• ISO 9001 • QS 9000
Indicators / Symptoms	include but not limited to: • Heating of parts • Loose connections • Burned or exposed parts • Malfunction of logic controls • Abnormal/Unusual Noise/Smell/vibration • Intermittent operation • High current reading

	• Tripping of breakers • High temperature
Electrical test	include but not limited to: • Continuity test • Electrical insulation test • High potential test (as the need arises) • Earth resistance test • Phase sequence test • Load test • Winding resistance test • Free running test
Other works	include but not limited to: • Mechanical works • Computer programs • Communication systems
Unforeseen events	include but not limited to: • Natural calamities • Emergency situations • Accidents
Performance Test	include but not limited to: • Simulation Test/No Load Test • Phase sequence • Actual Operation • Temperature

Evidence Guide

Critical aspects of competency	Assessment requires evidence that the candidate: • Identified or determined faults and troubles • Identified cause of troubles • Performed/Followed maintenance and troubleshooting procedures • Analyzed and interpreted electrical machine circuit • diagram • Interpreted and analyzed periodic monitoring data • Demonstrated understanding on safety regulations applicable to worksite operations • Demonstrated understanding on the use of electrical testing equipment • Demonstrated understanding on final inspection procedures • Accomplishment of service report forms • Coordinated effectively with others to ensure safe and effective work operations
Underpinning Knowledge	Include but not limited to: 2.1 Ethiopian Building Code Standard requirements 2.2 Maintenance and troubleshooting procedures 2.3 Standard operating procedure in energizing electrical system 2.4 Measurement 2.5 Interpretation of electrical plans/shop drawings 2.6 Interpretation of indicating instrument readings and test instruments 2.7 Electrical Laws and principles 2.8 Sensors/Actuators 2.9 Computer Operations 2.10 Pneumatics and Electro-Pneumatics and Hydraulic 2.11 Types of potential hazards 2.12 Safety practices

Underpinning Skills	Include but not limited to: • Interpreting plan and details • Tracing circuits • Performing basic first-aid • Practicing safe working habits • Using test instruments • Troubleshooting skills • Application of maintenance procedures • Preparing/obtaining materials, PPE, tools, equipment and testing devices in line with established procedures • Estimating the time required to accomplish the job (depending on extent of damage) • Evaluating condition of damage • Selecting prevention and/or control measures • Proper handling of equipment, tools, materials and consumables • Operating computers • Communication skills
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.
Assessment Methods	Competency may be assessed through: • Interview / questioning / written test • Demonstration / Observation
Context of Assessment	Competency may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Industrial Electrical Machine s & Drives Servicing Level II	
Unit Title	**Diagnose and rectify fault in motor drive system**
Unit Code	**EEL EMD2 05 0511**
Unit Descriptor	This unit covers diagnosing and rectifying faults in systems controlling starting, speed, torque, power output, efficient running and braking of ac and dc. motors. The unit encompasses safe working practices, interpreting technical data, applying knowledge of ac and dc. motors operating parameters to logical fault finding processes, implementing fault rectification, safety and functional testing and reporting work activities and outcomes.

Element	Performance criteria
1. Prepare to diagnose and rectify faults.	1.1 OH& S procedures for a given work area are identified, obtained and understood. 1.2 Established OH& S risk control measures and procedures in preparation for the work are followed. 1.3 Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel. 1.4 The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel. 1.5 Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site. 1.6 Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2. Diagnose and rectify faults.	1.1 OH& S risk control measures and procedures for carrying out the work are followed. 1.2 The need to test or measure live is determined in strict accordance with OH& S requirements and when necessary conducted within established safety procedures. 1.3 Circuits/machines/plant are checked as being isolated where necessary in strict accordance OH& S requirements and procedures. 1.4 Logical diagnostic methods are applied to diagnose a.c. motor control system faults employing measurements and estimations of system operating parameters referenced to system operational requirements. 1.5 Suspected fault scenarios are tested as being the source of

	system problems. 1.6 Causes of the faults are identified and appropriately competent persons are engaged to rectify the fault where it is out side the scope of the control system. 1.7 Faults in the control components of the system are rectified to raise ac. motor control system to its operation standard. 1.8 System is tested to verify that the system operates as intended and to specified requirements. 1.9 Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements. 1.10 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes. 1.11 Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3. Complete and report fault diagnosis and rectification activities.	3.1 OH& S work completion risk control measures and procedures are followed. 3.2 Work site is made safe in accordance with established safety procedures. 3.3 Rectification of faults is documented in accordance with established procedures. 3.4 Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

Variables	**Range**
Occupational Health and safety(OH& S)	Apply OH& S requirements in accordance with regulations/codes of practice and enterprise safety policies and procedures. This may include: o Using of relevant protective clothing and equipment, o Use of tooling and equipment, workplace environment and safety handling of material, o Use of fire fighting equipment, enterprise first aid, hazard control and hazardous materials and substances. o Using Chemical prove gowns, rubber boots of appropriate size, Goggles, respirators, helmet, and head phones , gloves etc, o Following Occupational health and safety procedures designated for the task o Checking and fulfilling required safety devices before starting operation

	Apply safe operating procedures regarding: o electrical safety, o machinery movement and operation, o manual and mechanical lifting and shifting, o Working in proximity to others and site visitors. Apply emergency procedures : o emergency shutdown and spring of equipment, o using extinguishing fires, first aid application and site evacuation
Tools and Equipment	Electronics tool kit, mechanical toolkit, fixing and support devices, relevant measuring tools

Evidence Guide	**Description**
Critical aspects of Assessment	Assessment requires evidence that the candidate: • Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement • Apply sustainable energy principles and practices as specified in the performance criteria and range statement • Demonstrate an understanding of the essential knowledge and associated skills as described in this unit . It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements. • Demonstrate an appropriate level of skills enabling employment • Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures • Manage risk in electro technology activities as described in unit of scope and including: o Identifying potential, perceived and actual risk events. o Using risk management methods, tools and techniques in analysis and reporting. o Incorporating risk management processes and procedures into program and project plans. o Monitoring and responding risk/problems/fault events effectively. o Identifying improvements and documenting recommendation for their inclusion in ongoing or future programs and projects.

	o Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.
Underpinning knowledge	Include but not limited to: • Variable speed drives for d.c.and a.c. motors • Occupational Health and Safety principles • Electrical Safe working practices
underpinning skill	Include but not limited to: • Interpret work instructions • Interpret and define work procedures • Selection and use of proper tools & equipment • Installation skills • Problem solving in unplanned events • Instrumentation safe working practices • Problem solving in unplanned events
Resource Implications	Include but not limited to: • Workplace or fully equipped assessment location with 1 necessary tools and equipment as well as consumable materials • Approved assessment tools • Certified assessor /Assessor's panel
Methods of assessment	Competency may be assessed through: • Practical assessment o Technical Interview/oral questioning o Practical demonstration o Simulation by off site practical test o Structured Observation of work • Theoretical exam • Supervisor report • Portfolio Assessment (Eg. Certificate from training providers)
Context of assessment	• Competency may be assessed in the work place or in a simulated work place setting • The unit of competency should be assessed in conjunction with other relevant units in this occupation.

TOP

Occupational Standard: Industrial Electrical Machines and Drives Servicing Level II	
Unit Title	**Perform Commissioning of Electrical Equipment/Systems**
Unit Code	**EEL EMD2 06 0511**
Unit Descriptor	This unit covers the knowledge, skill and attitudes in commissioning electrical equipment and all auxiliary system used in industrial establishments based on the required performance standards.

Elements	Performance Criteria
1. Plan and prepare commissioning activities	1.1 Work instructions are confirmed to immediate to ensure clear understanding of job requirements 1.2 Commissioning procedures are planned according to job requirements 1.3 Materials and PPE needed to complete job requirements are obtained in line with established procedures 1.4 Tools, equipment and testing devices needed for commissioning procedures are obtained, estimated and inspected for compliance with the job specifications 1.5 Potential hazards are identified and prevention and/or control measures are selected in accordance with the work plan and site procedures 1.6 Commissioning activities are coordinated with the end-user or the department involved in accordance with the established procedures
2. Commission electrical equipment/systems	2.1 Safety policies and procedures are followed in accordance with duly accepted international safety standards 2.2 ***Electrical testing criteria*** are followed in line with job requirements and established procedures 2.3 Electrical equipment/systems are commissioned in line with the established procedures 2.4 Unforeseen events are responded in line with established procedures 2.5 Records, electrical plans and schematic diagrams are revised /updated according to changes incurred during commissioning 2.6 Test data forms are filled-out and submitted to immediate superior for evaluation
3. Turn-over electrical	3.1 Final inspection is undertaken to ensure that commissioning of electrical system meets job requirements

equipment/systems	3.2 Tools, equipment and any excess resources and materials are cleaned, checked and returned to storage area in accordance with enterprise procedures 3.3 Written report is prepared and submitted to immediate superior in accordance with enterprise procedures 3.4 Monitoring data sheet for the newly installed system is accomplished based on the job requirements 3.5 Orientation and technical assistance is provided to prospective operators based on company procedures.

Variable	Range
Commissioning procedures	• Formulate checklist of machine and • equipment parts • Check completeness of installation based on plans/diagrams • Perform electrical testing • Perform no-load and load testing • Perform monitoring of meters and gauges • Orient end-user regarding systems operations • Turn over electrical equipment to end-user
Personal protective equipment (PPE)	Including but not limited to: • Working gloves • Safety shoes • Hard hat • Face shield • Insulating mat • Ear plug
Tools, equipment and testing devices	Including but are not limited to: • Electrical hand tools o Pliers o Screwdrivers o Wrenches o Wire splicers o Electrician knives • Testing instruments o Multi-tester (VOM) o Ammeter o Insulation resistance tester o Ground resistance tester o Lux meter o Thermal scanner o Flow meter

	o Pressure gauge o Pressure Analyzer/ Gauge manifold o Leak tester • Labeling machine • Warning signages • Lock-out/Tag-out • Phase-sequence indicator • Thermometer • Tachometer • Telephone/telephone handset
Potential hazards	Including but not limited to: • Live wires • Oil spill • Chemical hazards • Flammable materials • Sources of energy • Moving machine parts • Sharp/pointed objects • Noise hazards • Confined space
Electrical testing criteria	include but are not limited to: • Continuity test Completely filled-up continuity test report Instrument calibrated and certified annually Used of appropriate test instrument (e.g. analog/digital, multi-meter or ohmmeter) All tools, instrument, equipment and materials in proper place without unnecessary things within work perimeter • Electrical insulation test Appropriate instrument is used in the testing Megger test data sheet filled-up completely Accuracy of test result obtained within tolerable limit Instrument calibrated and certified annually • High potential test Appropriate instrument is used in the testing Instrument calibrated and certified annually Test Data Sheet completely filled-up • Earth resistance test Appropriate instrument is used in the testing Instrument calibrated and certified annually Test report completely filled-up Test reading accuracy is obtained with tolerance limit

	• Phase sequence test Appropriate instrument is used in the testing Tagging power line in accordance of phase sequence results from the main distribution panel down to the load Completely filled-up report in accordance with the test result • Load test Appropriate instrument is used in the testing Load test reading accuracy within tolerance limit Test Data Sheet completely filled-up • Voltage test Appropriate instrument is used in the testing Accuracy of test result is obtained within tolerable limit Voltage Test Data Sheet properly filled-up • Winding resistance test Appropriate instrument is used in the testing Instrument calibrated and certified annually Winding Resistance Test Data Sheet completely filled-up Accuracy of test result is obtained within tolerable limit • Polarization index (P.I.) test Appropriate instrument is used in the testing Polarization Index Test Data Sheet filed-up completely Followed Polarization Index Test procedures Instrument calibrated and certified annually • Lock rotor test Appropriate instrument is used in the testing Test report completely filled-up Test reading accuracy is obtained within tolerable limit • Free running test Appropriate instrument is used in the testing Test reading accuracy is obtained within tolerable limit Test report complete filled-up • Open/short circuit test Appropriate instrument is used in the testing Instrument calibrated and certified annually Test reading accuracy is obtained with tolerable limit Test report completely filled-up • Transformer turn ratio test Appropriate instrument is used in the testing Instrument calibrated and certified annually Test reading accuracy is obtained with tolerable limit Completely filled-up TTR portion of Transformer Test Data Sheet

	• Dielectric strength test Appropriate instrument is used in the testing Test Data Sheet completely filled-up • Voltage excitation test Appropriate instrument is used in the testing Reading accuracy of test result is obtained within tolerable limit Test Data Sheet completely filled-up • Energizing electrical system Appropriate instrument is used in the testing Final check for loose connection, wire arrangement, cleanliness, enclosure appearance insulation resistance measurement in the presence of commission's team as per client standard requirement Energize equipment one-by-one Voltage and current measurement within tolerable limit base on equipment nameplate in the presence of commissioning team Completely filled-up record form for all measurement

Evidence Guide	
Critical aspect of competency	Assessment requires evidence that the candidate: • Planned commissioning procedures in line with job requirements • Prepared/obtained materials, PPE, tools, equipment and testing devices in line with established procedures and job specifications • Demonstrated compliance with safety regulations applicable to worksite operations • Performed commissioning activities in line with established procedures • Undertaken final inspection to ensure commissioning electrical system meet job requirements • Communicated effectively with others to ensure safe and effective work operations • Prepared complete report of commissioned electrical equipment/ system • Demonstrated good working attitudes
Underpinning knowledge	• Handling of equipment, tools, materials and consumables • Ethiopian Building Code Standards (EBCS) requirements • Standard operating procedure in energizing electrical system • Measurement • Knowledge on how to operate the test instruments • Interpretation of electrical plans/shop drawings • Electrical Laws and Principles • Pneumatics and Electro-Pneumatics/Hydraulic • Computer Operations • Environmental laws • Occupational Health & Safety procedures
Underpinning skills	• Interpreting plan and details • Tracing circuits • Performing electrical test • Using test instruments • Troubleshooting skills • Performing first-aid • Hazards prevention/control measures • Practicing safe working habits • Operating computers
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.

Assessment Methods	Competency may be assessed through: • Interview / questioning / written test • Demonstration / Observation
Context of Assessment	Competency may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Industrial Electrical Machines and Drives Servicing Level II	
Unit Title	**Participate In Workplace Communication**
Unit Code	**EEL EMD2 07 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to gather, interpret and convey information in response to workplace requirements.

Elements	Performance Criteria
1. Obtain and convey workplace information	1.1 Specific and relevant information is accessed from ***appropriate sources*** 1.2 Effective questioning , active listening and speaking skills are used to gather and convey information 1.3 Appropriate medium is used to transfer information / ideas 1.4 Appropriate non- verbal communication is used 1.5 Appropriate lines of communication with supervisors and colleagues are identified and followed 1.6 Defined workplace procedures for the location and storage of information are used 1.7 Personal interaction is carried out clearly and concisely
2. Participate in workplace meetings and discussions	2.1 Team meetings are attended on time 2.2 Own opinions are clearly expressed and those of others are listened to without interruption 2.3 Meeting inputs are consistent with the meeting purpose and established protocols 2.4 Workplace interactions are conducted in a courteous manner 2.5 Questions about simple routine workplace procedures and maters concerning working conditions of employment are asked and responded to 2.6 Meetings outcomes are interpreted and implemented
3. Complete relevant work related documents	3.1 Range of ***forms*** relating to conditions of employment are completed accurately and legibly 3.2 Workplace data is recorded on standard workplace forms and documents 3.3 Basic mathematical processes are used for routine calculations 3.4 Errors in recording information on forms/ documents are

	identified and properly acted upon 3.5 Reporting requirements to supervisor are completed according to organizational guidelines

Variable	Range
Appropriate sources	• Team members • Suppliers • Trade personnel • Local government • Industry bodies
Medium	• Memorandum • Circular • Notice • Information discussion • Follow-up or verbal instructions • Face to face communication
Storage	• Manual filing system • Computer-based filing system
Forms	• Personnel forms, telephone message forms, safety reports
Workplace interactions	• Face to face • Telephone • Electronic and two way radio • Written including electronic, memos, instruction and forms, non-verbal including gestures, signals, signs and diagrams
Protocols	• Observing meeting • Compliance with meeting decisions • Obeying meeting instructions

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • Prepared written communication following standard format of the

	organization • Accessed information using communication equipment • Made use of relevant terms as an aid to transfer information effectively • Conveyed information effectively adopting the formal or informal communication
Underpinning Knowledge and Attitudes	• Effective communication • Different modes of communication • Written communication • Organizational policies • Communication procedures and systems • Technology relevant to the enterprise and the individual's work responsibilities
Underpinning Skills	• Follow simple spoken language • Perform routine workplace duties following simple written notices • Participate in workplace meetings and discussions • Complete work related documents • Estimate, calculate and record routine workplace measures • Basic mathematical processes of addition, subtraction, division and multiplication • Ability to relate to people of social range in the workplace • Gather and provide information in response to workplace Requirements
Resource Implications	• Fax machine • Telephone • Writing materials • Internet
Assessment Methods	Competence may be assessed through: • Interview / questioning / written test • Simulation/demonstration • Observation
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Industrial Electrical Machines and Drives Servicing Level II	
Unit Title	**Work In Team Environment**
Unit Code	**EEL EMD2 08 0911**
Unit Descriptor	This unit covers the skills, knowledge and attitudes to identify role and responsibility as a member of a team.

Elements	Performance Criteria
1. Describe team role and scope	1.1 The ***role and objective of the team*** is identified from available ***sources of information*** 1.2 Team parameters, reporting relationships and responsibilities are identified from team discussions and appropriate external sources
2. Identify own role and responsibility within team	2.1 Individual role and responsibilities within the team environment are identified 2.2 Roles and responsibility of other team members are identified and recognized 2.3 Reporting relationships within team and external to team are identified
3. Work as a team member	3.1 Effective and appropriate forms of communications used and interactions undertaken with team members who contribute to known team activities and objectives 3.2 Effective and appropriate contributions made to complement team activities and objectives, based on individual skills and competencies and workplace context 3.3 Observed protocols in reporting using standard operating procedures 3.4 Contribute to the development of team work plans based on an understanding of team's role and objectives and individual competencies of the members.

Variable	Range

Role and objective of team	• Work activities in a team environment with enterprise or specific sector • Limited discretion, initiative and judgment maybe demonstrated on the job, either individually or in a team environment
Sources of information	• Standard operating and/or other workplace procedures • Job procedures • Machine/equipment manufacturer's specifications and instructions • Organizational or external personnel • Client/supplier instructions • Quality standards • OHS and environmental standards
Workplace context	• Work procedures and practices • Conditions of work environments • Legislation and industrial agreements • Standard work practice including the storage, safe handling and disposal of chemicals • Safety, environmental, housekeeping and quality guidelines

Evidence Guide	
Critical Aspects of competence	Assessment requires evidence that the candidate: • Operated in a team to complete workplace activity • Worked effectively with others • Conveyed information in written or oral form • Selected and used appropriate workplace language • Followed designated work plan for the job • Reported outcomes
Underpinning Knowledge and Attitude	• Communication process • Team structure • Team roles • Group planning and decision making
Underpinning Skills	• Communicate appropriately, consistent with the culture of the workplace

Evidence Guide

Resource Implications	The following resources must be provided: • Access to relevant workplace or appropriately simulated environment where assessment can take place • Materials relevant to the proposed activity or tasks
Methods of Assessment	Competence may be assessed through: • Observation of the individual member in relation to the work activities of the group • Observation of simulation and or role play involving the participation of individual member to the attainment of organizational goal • Case studies and scenarios as a basis for discussion of issues and strategies in teamwork
Context for Assessment	• Competence may be assessed in workplace or in a simulated workplace setting • Assessment shall be observed while task are being undertaken whether individually or in group

TOP

Occupational Standard: Industrial Electrical Machines & Drives Servicing Level II	
Unit Title	**Develop Business Practice**
Unit Code	**EEL EMD2 09 0511**
Unit Descriptor	This unit specifies the outcomes required to establish a business operation from a planned concept. It includes researching the feasibility of establishing a business operation, planning the setting up of the business, implementing the plan and reviewing operations once commenced

Elements	Performance Criteria
1. Identify business opportunities	1.1 ***Business opportunities*** are investigated and identified 1.2 Feasibility study is undertaken to determine likely ***business viability*** 1.3 Market research on product or service is undertaken 1.4 Assistance with feasibility study of ***specialist and relevant parties*** is sought as required 1.5 Impact of emerging or changing technology including e-commerce, on business operations are evaluated 1.6 Practicability of business opportunity assessed in line with perceived risks, returns sought and resources available 1.7 Business plan for operation is completed
2. Identify personal business skills	2.1 Financial and business skills available are identified and taken into account when business opportunities are researched 2.2 ***Personal skills/attributes*** are assessed and matched against those perceived as necessary for a particular business opportunity 2.3 Business risks are identified and assessed according to resources available and personal preferences
3. Plan for establishment of business operation	3.1 Business structure and operations are determined and documented 3.2 Procedures to guide operations are developed and documented 3.3 Financial backing for business operation is secured

	3.4 Business legal and regulatory requirements are identified and complied 3.5 ***Human and physical resources*** required to commence business operation are determined 3.6 Recruitment strategies are developed and implemented
4. Implement establishment plan	4.1 Marketing of business operation is undertaken 4.2 Physical and human resources to implement business operation are obtained 4.3 ***Operational unit*** to support and coordinate business operation is established 4.4 Monitoring process for managing operation is developed and implemented 4.5 ***Legal documents*** are carefully maintained and relevant ***records*** are kept and updated to ensure validity and accessibility 4.6 Contractual procurement rights for goods and services including ***contracts with relevant people***, negotiated and secured as required in accordance with the business plan 4.7 Options for leasing/ownership of business premises identified and contractual arrangements completed in accordance with the business plan
5. Review implementation process	5.1 Review process for implementation of business operation is developed and implemented 5.2 Improvements in business operation and associated management process are identified 5.3 Identified improvements are implemented and monitored for effectiveness

Variable	**Range**
Resources may include:	• staff • money • time • equipment • space
Business goals may include:	• sales targets • budgetary targets

	• team and individual goals • production targets • reporting deadlines
Problem solving techniques may include:	• gaining additional research and information to make better informed decisions • looking for patterns • considering related problems or those from the past and how they were handled • eliminating possibilities • identifying and attempting sub-tasks • collaborating and asking for advice or help from additional sources
Time management strategies may include:	• 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:	• staff and colleagues • management, supervisors, advisors or head office • relevant professionals such as lawyers, accountants, management consultants • professional associations

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
Underpinning Knowledge and Attitudes	• Federal and Local Government legislative requirements affecting business operations, especially in regard to occupational health and safety (OH&S), equal employment opportunity (EEO), industrial relations and anti-discrimination • technical or specialist skills relevant to the business operation • relevant industry code of practice • planning techniques to establish realistic timelines and priorities

	• identification of relevant performance measures • quality assurance principles and methods • relevant marketing, management, sales and financial concepts • methods for monitoring performance and implementing improvements • structured approaches to problem solving, idea management and time management
Underpinning Skills	• literacy skills to interpret legal requirements, company policies and procedures and immediate, day-to-day demands • communication skills including questioning, clarifying, reporting, and giving and receiving constructive feedback • numeracy skills for performance information, setting targets and interpreting financial documents and reports • technical and analytical skills to interpret business documents, reports and financial statements and projections • ability to relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities • problem solving skills to develop contingency plans • using computers and software packages to record and manage data and to produce reports • evaluation skills for assessing work and outcomes • observation skills for identifying appropriate people, resources and to monitor work
Resource Implications	The following resources should be provided: • Access to relevant workplace documentation, financial records, and equipment
Methods of Assessment	Competence may be assessed through: • Interview / Written exam • Observation/Demonstration with Oral questioning
Context for Assessment	Competence may be assessed in the workplace or in a simulated work environment

TOP

Occupational Standard: Industrial Electrical Machines and Drives Servicing Level II	
Unit Title	**Maintain an Effective Relationship with Client/Customers**
Unit Code	**EEL EMD2 10 0511**
Unit Descriptor	This unit covers the knowledge, skills and attitudes and values required in building and maintaining an effective relationship with clients, customers and the public.

Elements	Performance Criteria
1.Maintain a clean and hygienic environment	1.1 **Uniform and personal grooming maintained to assignment requirements.** 1.2 ***Personal presence*** maintained according to ***employer standards***. 1.3 Visible work area kept tidy and uncluttered. 1.4 Equipment stored according to assignment requirements.
2.Meet client/ customer requirements	2.1 Client requirements **identified and understood by referral to the** assignment instructions**.** 2.2 Client requirements met according to the assignment instructions. 2.3 Changes to **client's needs and requirements** monitored and **appropriate action taken**. 2.4 All communication with the client or **customer** is clear and complied with assignment requirements.
3.Work as a team member	3.1 Effective and appropriate forms of communications used and interactions undertaken with team members who contribute to known team activities and objectives *3.2* Effective and appropriate contributions made to complement team activities and objectives, based on individual skills and competencies and ***workplace context*** 3.3 Observed protocols in reporting using standard operating procedures 3.4 Contribute to the development of team work plans based on an understanding of team's role and objectives and individual competencies of the members.

4.Build credibility with customers/ clients	4.1 Possible causes of client/customer dissatisfaction identified, dealt with recorded according to employer policy. 4.2 Client fully informed of all relevant security matters in a timely manner and according to agreed reporting procedures.

Variable	**Range**
Client Requirements	May include: • Assignment Instructions • Post Orders • Scope to modify instructions/orders in light of changed situations
Assignment Instructions	May conveyed in: • Writing • Verbally • Electronically
Client Needs and Requirements	May be detected by: • Review of the client brief and/or assignment instructions Discussion with the client/customer
Customers	May include: All members of the public

Evidence Guide	
Critical aspects of competence	Assessment requires that the candidate: • Maintained a professional image. • Interpreted client/customer requirements from information contained in the client brief and/or assignment instructions. • Dealt successfully with a variety of client/customer interactions. • Monitored and acted on changing client or customer needs. • Met client/customer requirements. • Built credibility with customers/clients
Underpinning Knowledge and Attitude	• Uniform and personal grooming requirements f the employer and the client • Occupational health and safety requirement for the assignment • Assignment Instructions
Underpinning Skills	• Attention to detail when completing client/employer documentation • Interpersonal and communication skills required in client contact assignments

	• Customer service skills required to meet client/customer needs • Punctuality • Customer Service • Telephone Technique • Problem Solving and Negotiation • Maintaining Records
Resources Implication	Assessment is required to take place in real or appropriate simulated situations, including work areas, materials & equipment, & information on workplace practices and OHS practices.
Assessment Methods	Competency may be assessed through: • Interview / Written Test / Oral Questioning • Observation / Demonstration
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Industrial Electrical Machines and Drives Servicing Level II	
Unit Title	**Apply Continuous Improvement Processes (Kaizen)**
Unit Code	**EEL EMD2 11 1012**
Unit Descriptor	This unit of competence covers the exercise of good workplace practice and effective participation in quality improvement teams. Personnel are required to ensure the quality and integrity of their own work, detect non-conformances and work with others to suggest improvements in productivity and quality.

Elements	**Performance Criteria**

1. Satisfy quality system requirements in daily work	1.1 Access information on quality system requirements for own job function 1.2 Record and report quality control data in accordance with quality system 1.3 Follow ***quality control procedures*** to ensure products, or data, are of a defined quality as an aid to acceptance or rejection 1.4 Recognize and report non-conformances or problems 1.5 Conduct work in accordance with ***sustainable energy work practices*** 1.6 Promote sustainable energy principles and work practices to other workers
2. Analyze opportunities for corrective and/or optimization action	2.1 Compare current work practices, procedures and process or equipment performance with requirements and/or historical data or records 2.2 Recognize variances that indicate abnormal or sub-optimal performance 2.3 Collect and/or evaluate batch and/or historical records to determine possible causes for sub-optimal performance 2.4 Use appropriate quality improvement techniques to rank the probabilities of possible causes
3. Recommend corrective and/or optimization actions	3.1 Analyze causes to predict likely impacts of changes and decide on the appropriate actions 3.2 Identify required changes to standards and procedures and training 3.3 ***Report*** recommendations to designated personnel

4. Participate in the implementation of recommended actions	4.1 Implement approved actions and monitor performance following changes to evaluate results 4.2 Implement changes to systems and procedures to eliminate possible causes 4.3 Document outcomes of actions and communicate them to ***relevant personnel***
5. Participate in the development of continuous improvement strategies	5.1 Review all relevant features of work practice to identify possible contributing factors leading to sub-optimal performance 5.2 Identify options for removing or controlling the risk of sub-optimal performance 5.3 Assess the adequacy of current controls, quality methods and systems 5.4 Identify opportunities to continuously improve performance

	5.5 Develop recommendations for continual improvements of work practices, methods, procedures and equipment effectiveness 5.6 Consult with appropriate personnel to refine recommendations before implementation of approved improvement strategies 5.7 Document outcomes of strategies and communicate them to relevant personnel

Variable	**Range**
Quality control procedures	Quality control procedures may include: • standards imposed by regulatory and licensing bodies • enterprise quality procedures • working to a customer brief or batch card and associated quality procedures • checklists to monitor job progress against agreed time, costs and quality standards • preparation of sampling plans • the use of hold points to evaluate conformance • the use of inspection and test plans to check compliance
Methods for statistical analysis	Methods for statistical analysis may include: • means • median • mode • ranges • standard deviations • statistical sampling procedures
Problem solving techniques	Problem solving techniques may include: • identifying inputs and outputs • sequencing a process • identifying and rectifying a problem step • root cause analysis • implementing preventative strategies
Quality improvement tools and techniques	Quality improvement tools and techniques may include: • run charts, control charts, histograms and scattergrams to present routine quality control data • plan, do, check, act (PDCA) • Ishikawa fishbone diagrams and cause and effect diagrams • logic tree • similarity/difference analysis • Pareto charts and analysis • force field/strength weakness opportunities threats (SWOT) analysis

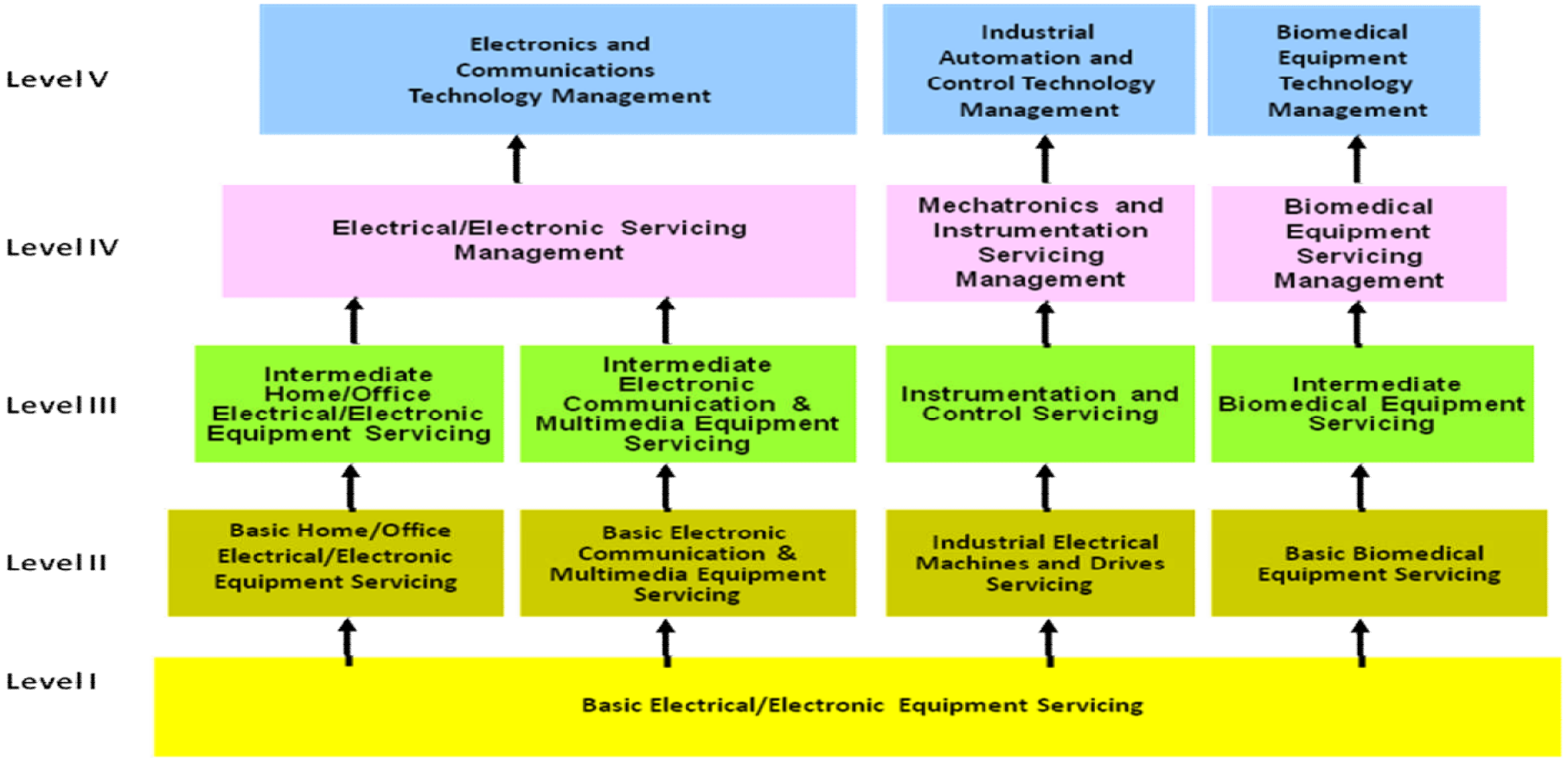
Sustainable energy principles and work practices	Sustainable energy principles and work practices may include: • examining work practices that use excessive electricity • switching off equipment when not in use • regularly cleaning filters • insulating rooms and buildings to reduce energy use • recycling and reusing materials wherever practicable • minimizing process waste
Relevant personnel	Communication to relevant personnel may involve: • supervisors, managers and quality managers • administrative, laboratory and production personnel • internal/external contractors, customers and suppliers
Reporting	Reporting may include: • verbal responses • data entry into laboratory or enterprise database • brief written reports using enterprise proformas
Quality improvement opportunities	Quality improvement opportunities could include improved: • production processes • hygiene and sanitation procedures • reductions in waste and re-work • laboratory layout and work flow • safety procedures • communication with customers • methods for sampling, testing and recording data
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through regional or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the Ministry of Health

Evidence Guide	
Critical Aspects of Competence	Assessors should ensure that candidates can: • use the enterprise's quality systems and business goals as a basis for decision making and action • apply all relevant procedures and regulatory requirements to ensure the quality and integrity of the products/services or data provided • apply and promote sustainable energy principles and work practices • detect non-conforming products or services in the work area • follow enterprise procedures for documenting and reporting

	information about quality • contribute effectively within a team to recognize and recommend improvements in productivity and quality • apply effective problem solving strategies • implement and monitor improved practices and procedures
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • specifications for laboratory products and services in the candidate's work area • quality requirements associated with the individual's job function and/or work area • scientific and technical knowledge underpinning the processes, procedures, equipment and instrumentation associated with the candidate's work tasks and duties • workplace procedures associated with the candidate's regular technical duties • sustainable energy principles • relevant health, safety and environment requirements • layout of the enterprise, divisions and laboratory • organizational structure of the enterprise • lines of communication • role of laboratory services to the enterprise and customers • methods of making/recommending improvements • Standards, procedures and/or enterprise requirements
Underpinning Skills	Demonstrates skills to: • applying problem solving techniques and strategies • applying statistical analysis and statistical sampling procedures • detecting non-conforming products or services in the work area • documenting and reporting information about quality • contributing effectively within a team to recognize and recommend improvements in productivity and quality • implementing and monitoring improved practices and procedures • organizing, prioritizing activities and items • reading and interpreting documents describing procedures • recording activities and results against templates and other prescribed formats • working with others
Resources Implication	Access may be required to: • workplace procedures and plans relevant to work area • specifications and documentation relating to planned, currently being implemented, or implemented changes to work processes and procedures relevant to the candidate • documentation and information in relation to production,

	waste, overheads and hazard control/management • reports from supervisors/managers • case studies and scenarios to assess responses to contingencies • enterprise quality manual and procedures • quality control data/records • customer complaints and rectifications
Methods of Assessment	Competence in this unit may be assessed by using a combination of the following to generate evidence: • demonstration in the workplace • suitable simulation • case studies/scenarios (particularly for assessment of contingencies, improvement scenarios, and so on) • verified reports of improvements suggested and implemented by the candidate individually Those aspects of competence dealing with improvement processes could be assessed by the use of suitable simulations and/or a pilot plant and/or a range of case studies and scenarios. In all cases, practical assessment should be supported by questions to assess essential knowledge and those aspects of competence which are difficult to assess directly.
Context of Assessment	Competence may be assessed in the work place or in a simulated workplace setting / environment.

Sector: Electrotechnology and Telecommunication
Sub-Sector: Electrotechnology



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