

No. 1836

19 December 2003

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Electrical Engineering and Construction

Registered by **NSB 12 : Physical Planning and Construction** publishes the following qualifications and unit standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the unit standards upon which qualifications are based. The unit standards can be accessed via the SAQA web-site at www.saga.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, Hatfield Forum West, 1067 Arcadia Street, Hatfield.

Comment on the unit standards should reach SAQA at the address *below and no later than 18 January 2004*. All correspondence should be marked **Standards Setting – SGB for Electrical Engineering and Construction** and addressed to

The Director: Standards Setting and Development
SAQA

Attention: Mr. D Mphuthing

Postnet Suite 248

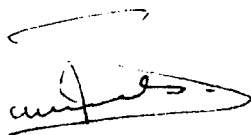
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SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:

National Certificate: Electrical Engineering

SAQA QUAL ID	QUALIFICATION TITLE	
48473	National Certificate: Electrical Engineering	
SGB NAME	SGB Electrical Engineering & Construction	
ABET BAND	PROVIDER NAME	
Undefined		
QUALIFICATION CODE	QUAL TYPE	SUBFIELD
PPC-2-National Certificate	National Certificate	Electrical Infrastructure Construction
MINIMUM CREDITS	NQF LEVEL	QUALIFICATION CLASS
150	Level 2	Regular-Unit Stds Based
SAQA DECISION NUMBER	REGISTRATION START DATE	REGISTRATION END DATE

PURPOSE OF THE QUALIFICATION

This qualification will allow a person to advance through learning to an electrical qualification at NQF level 3. The core- and required elective Unit Standards provide credits that allow access to both vertically and horizontally articulated qualifications. This qualification will enhance the social status, productivity and employability of the learner within the electrical engineering and energy sector and contributes to the quality, production rate and growth of the electrical engineering and energy sector.

Through the critical cross-field component of the qualification, learners are able to demonstrate vocational skills through which they are able to engage in life skills activities, small business development, health and environmental issues. Through recognition of prior learning adult learners are encouraged to access basic education with an understanding that they already have knowledge and experience.

Hand skills play a vital role in this qualification.

Qualified learners will also understand:

- > The basics of how the business unit functions
- > Their role in the business, i.e. in construction, maintenance and related activities
- > How they are affected by legislation, regulations, agreements and policies related to their particular work environment.

With this understanding, learners will be able to participate in workplace activities.

Rationale of the qualification:

This is the first occupation based qualification in a series for learners that reflect the workplace-based needs of the electrical field that is expressed by employers and employees, both now and for the future. This qualification provides the learner with accessibility to be employed within the electrical field and provides the flexibility to pursue different careers in the broader electrical engineering energy sector and articulate within the Engineering, Electrical Construction, Generation, Transmission and Distribution specialization contexts. It also provides the Learner with enough knowledge and skills to pursue small business opportunities within the private sector through which the private sector and the economy can benefit.

For those who have acquired experience in the workplace, this qualification represents part of the RPL process to acknowledge workplace skills acquired without the benefit of former education or training.

RECOGNIZE PREVIOUS LEARNING?

Y

LEARNING ASSUMED TO BE IN PLACE

This qualification assumes learners have a General Education and Training Certificate at NQF level 1.

Recognition of Prior Learning:

This qualification may be obtained in whole or in part through RPL. The learner should be thoroughly briefed on the mechanism to be used and support and guidance should be provided. Care should be taken that the mechanism used provides the learner with an opportunity to demonstrate competence and is not so onerous as to prevent learners from taking up the RPL option towards gaining a qualification.

QUALIFICATION RULES

The rules of combination for this Qualification:

The Fundamental component of NQF Level 2-4 Qualifications for achieving a National Certificate requires a minimum of twenty credits for the "Communication and Language Studies" category and sixteen credits for the "Mathematics and Science" category. These qualifications also require a minimum of 120 credits in total in order to obtain a Certificate.

This Qualification's Fundamental, Core and Elective components are made up as follows:

Fundamental Unit Standards:

The "Communication and Language Studies" category contains 25 Credits and the "Mathematics and Science" category 32 Credits. This amounts to 57 Credits for the Fundamental component of the Qualification.

Core Unit Standards:

This amounts to 83 credits.

Elective Unit Standards:

This amounts to 53 Credits of which a minimum of ten Credits must be done.

The total Credits for this Qualification are 193 Credits of which a minimum 150 Credits must be done to achieve a Certificate.

EXIT LEVEL OUTCOMES

1. Demonstrate an understanding of procedures for electrical installations and an ability to use and maintain electrical equipment to meet quality and output requirements, working safely and in an environmentally aware manner.
2. Demonstrate a basic operational knowledge of mathematical, technological and theoretical concepts during the execution of tasks with an ability to read, interpret technical drawings and sketch basic electrical wiring diagrams.
3. Apply known solutions to familiar and well-defined problems related to working in the electrical engineering and energy environment with a basic understanding of forms of energy, energy efficiency and environmental awareness.

ASSOCIATED ASSESSMENT CRITERIA

- 1.1 The procedures for basic technical practices regarding electrical installations is described, explained and conducted in accordance with drawings, plans and specified requirements.
- 1.2 The use of hand tools, power tools (fixed and portable) and measuring instruments are explained and maintained in accordance with standard operating procedures.
- 1.3 Electrical installations- and equipment are identified and related to in accordance with output requirements.
- 1.4 Electrical equipments are inspected, cleaned, maintained and data recorded is clearly communicated to meet quality and output requirements.
- 1.5 Knowledge and understanding regarding personal and occupational safety practices in a commercial, industrial or domestic electrical engineering and energy environment is applied according to standard operating procedures and safety requirements.

2.1 Knowledge and understanding of technologies applied in the electrical engineering and energy environment, alternative forms of energy, energy efficiency and terminology, are demonstrated according to standard industry principles.

2.2 Knowledge and understanding of mathematical and theoretical concepts, materials and work contexts are identified, explained and demonstrated according to standard electrical engineering and energy industry principles.

2.3 The execution of tasks and technical practices are executed in a manner which comply with specified requirements to eliminate, minimise or control the risk of injuries.

2.4 Technical drawings are interpreted according to industry requirements.

2.5 Basic electrical wiring diagrams are sketched and interpreted according to symbols and components as prescribed by ISO standards.

2.6 Specified reporting and recording requirements are complied with.

Range: Specified reporting and recording must include:

- > Reporting to supervisor
- > Submitting reports
- > Logbook entries
- > Permit documentation

3.1 Known solutions to familiar and well-defined problems within the electrical construction and maintenance environment are identified, explained and applied according to standard practices.

3.2 Energy efficiency and related environmental issues are identified, described and discussed that enables a learner to resolve problems in the work environment.

Integrated Assessment:

The applied competence (practical, foundational and reflective competencies) of this qualification will be achieved if a learner is able to achieve all exit level outcomes of the qualification.

The identification and solving of problems, team work, organising self, using of technical diagrams, implication of actions and reactions in the world as a set of related systems must be assessed during any combination of practical, foundational and reflective competencies assessment methods and tools to determine the whole person development and integration of applied knowledge and skills.

- > Certain exit level outcomes are measurable and verifiable through assessment criteria assessed in one application.
- > Applicable assessment tool(s) to establish the foundational, reflective and embedded knowledge to problem solving and application of the world as a set of related systems within the electrical installation and maintenance environment.
- > A detailed portfolio of evidence is required to prove the practical, applied and foundational competencies of the learner.
- > Assessors and moderators should develop and conduct their own integrated assessment by making use of a range of formative and summative assessment methods. Assessors should assess and give credit for the evidence of learning that has already been acquired through formal, informal and non-formal learning and work experience.
- > Summative assessment should also encompass achievement of the competence described both in individual Unit Standards, exit level outcomes as well as the integrated competence described in the qualification.

Unit Standards associated with the qualification must be used to assess specific and critical cross-field outcomes. During integrated assessments the assessor should make use of formative and summative assessment methods and should assess combinations of practical, applied, foundational and reflective competencies.

INTERNATIONAL COMPARABILITY

This Qualification is benchmarked against international standards and Qualifications. The Unit Standards on which this Qualification is based were compared with Unit Standards from New Zealand, Australia and Scotland in terms of their range of electrical Qualifications, Unit Standard titles, specific outcomes, assessment criteria and degree of difficulty.

This Qualification has been compiled to be more generic to the entire low-and high voltage electrical

engineering, construction and renewable energy industries, where-as the Qualifications for the above mentioned countries are subdivided into different domains of the low voltage electrical engineering field. However, the overall scope of the other countries' Unit Standards for the electrical field has been adequately covered in this Qualification. The focus and complexity level of the core Units Standards compares very well, but the upliftment of literacy, numeracy and social skills have been emphasized more in the fundamental requirement of this Qualification to redress the inequalities of the past. More credits are therefore needed for this level than what is required for similar international levels.

The core-and elective Unit Standards of this Qualification are more focused on the practical application, with the theoretical requirements built into the embedded knowledge. Only a few standards focus on theory, but is written more generically than those of the other countries. The international Qualifications on the other hand, included more knowledge-based Unit Standards with less credits linked to it.

ARTICULATION OPTIONS

This qualification will allow a person to advance to learning for an electrical engineering qualification at NQF level 3. This qualification provides the learner with the flexibility to pursue different careers in the electrical engineering and energy sector and articulation within the engineering industries. The level of flexibility within the range of electives will allow the individual to pursue further learning within life skills for the world of work, quality assurance, health and safety and engineering contexts.

MODERATION OPTIONS

- > Anyone assessing a learner or moderating the assessment of a learner against this Qualification must be registered as an assessor with the relevant ETQA.
- > Any institution offering learning that will enable the achievement of this Qualification must be accredited as a provider with the relevant ETQA.
- > Assessment and moderation of assessment will be overseen by the relevant ETQA according to the ETQA's policies and guidelines for assessment and moderation; in terms of agreements reached around assessment and moderation between ETQA's (including professional bodies); and in terms of the moderation guideline detailed immediately below.
- > Moderation must include both internal and external moderation of assessments at exit points of the qualification, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described both in individual Unit Standards, exit level outcomes as well as the integrated competence described in the qualification.

Anyone wishing to be assessed against this Qualification may apply to be assessed by any assessment agency, assessor or provider institution that is accredited by the relevant ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

Assessors need experience in the following areas:

Interpersonal skills, subject matter and assessment.

The assessor needs to be competent in planning, conducting and providing feedback on assessment of learning outcomes and in the design and development of assessments as described in the Unit Standards. The assessor should at least be competent at the same level or be at a level above this level 2 Qualification with at least two years of practical experience in the electrical engineering or related environment. The assessor must comply with the criteria set by the relevant ETQA.

The subject matter experience of the assessor can be established by recognition of prior learning.

Assessors need to be registered with the relevant Education and Training Quality Assurance Body.

NOTES

Qualification review and linkages:

This Qualification is part of a review of four registered ones called "General Education and Training

Certificate in Basic Technical Practice (Energy) - NQF Level 1" and "National Certificates in Electrical Engineering - NQF Level 2-4".

During the review it was found that the registered "General Education and Training Certificate in Basic Technical Practice (Energy) - NQF Level 1" is too specific to the electrical engineering and construction environment, instead of being more generic to the entire electrical engineering and energy industry. Its Elective component mainly contains Unit Standards that should be part of the NQF Level 2 Qualification. The registered Qualifications for NQF Levels 1-4 also contain a lot of Unit Standards that were designed specifically for multi-skilling persons within the mechanical trade, of which some are too activity based.

There shall be a clear link between the currently registered and the new proposed Qualifications in the sense that many of the Unit Standards shall be the same, but shall be placed differently in mainly the Core component of the Qualifications. This is done to achieve a more progressive build-up from an entry level for the electrical industry at NQF 2, single phase installations at NQF 3, through to more complex Unit Standards such as those for three phase installations at NQF 4. Renewable energy shall also be part of the Elective component of these Qualifications.

The future GETC Qualification for Basic Technical Practice (Energy) at NQF Level 1 shall be mainly knowledge-based and shall be a generic entry level for the entire electrical engineering and energy industry.

All the activity-based Unit Standards shall not be part of the new Qualifications, but shall be replaced with new Elective Unit Standards that are required by the different electrical industries.

UNIT STANDARDS

(Note: A blank space after this line means that the qualification is not based on Unit Standards.)

	UNIT STANDARD ID AND TITLE	LEVEL	CREDITS	STATUS
Core	9839 Apply and maintain safety in an electrical environment	Level 1	5	Registered
Core	9964 Apply health and safety to a work area	Level 2	8	Registered
Core	10233 Install and/or replace an electrical metering units or measuring instruments	Level 2	4	Registered
Core	10237 Select, use and care for electrical measuring instruments	Level 2	4	Registered
Core	10252 Identify, inspect, use, maintain and care for engineering hand tools	Level 2	6	Registered
Core	10253 Install electric wire ways	Level 2	6	Registered
Core	10254 Maintain electrical distribution boards, panels and enclosures	Level 2	6	Registered
Core	10255 Select, use and care for power tools	Level 2	5	Registered
Core	11954 Design and construct a single phase circuit	Level 2	5	Registered
Core	113858 Maintain transformers	Level 2	5	Draft - Prep for P Comment
Core	113863 Apply soldering techniques	Level 2	2	Draft - Prep for P Comment
Core	113870 Identify, handle and assemble Low Voltage hardware and related materials	Level 2	4	Draft - Prep for P Comment
Core	113876 Inspect and clean electrical machines	Level 2	4	Draft - Prep for P Comment
Core	113877 Understand fundamentals of electricity	Level 2	8	Draft - Prep for P Comment
Core	113879 Install luminaires	Level 2	4	Draft - Prep for P Comment
Core	9888 Select, use and care for marking off/out equipment: routine shapes	Level 3	8	Registered
Elective	8200 Service and test battery	Level 2	5	Registered
Elective	9880 Perform basic welding/joining of metals	Level 2	8	Registered
Elective	12483 Perform basic first aid	Level 2	4	Registered
Elective	12484 Perform basic fire fighting	Level 2	4	Recommended
Elective	13622 Ensure safety at road works in urban areas	Level 2	2	Registered
Elective	14701 Join sheetmetal with resistance arc welding process	Level 2	4	Recommended
Elective	113859 Repair and service small gas appliances	Level 2	4	Draft - Prep for P Comment

Elective	113860 Demonstrate an understanding of the uses and safety aspect associated with flammable energy sources	Level 2	3	Draft - Prep for P Comment
Elective	113861 Maintain servitudes, wayleaves and clearances	Level 2	5	Draft - Prep for P Comment
Elective	113868 Handle and care of electrical earthing gear and related equipment	Level 2	2	Draft - Prep for P Comment
Elective	113872 Identify, handle and assemble medium / high voltage line hardware and related materials	Level 2	4	Draft - Prep for P Comment
Elective	113887 Inspect and clean medium / high voltage yards and enclosures	Level 2	2	Draft - Prep for P Comment
Fundamental	7469 Use mathematics to investigate and monitor the financial aspects of personal and community life	Level 2	2	Registered
Fundamental	7479 Describe, represent and informally analyse shape and motion in 2- and 3-dimensional space	Level 2	4	Registered
Fundamental	7547 Operate a personal computer system	Level 2	6	Reregistered
Fundamental	8962 Maintain and adapt oral communication	Level 2	5	Registered
Fundamental	8963 Access and use information from texts	Level 2	5	Registered
Fundamental	8964 Write for a defined context	Level 2	5	Registered
Fundamental	8982 Demonstrate understanding of rational and irrational numbers and number systems within the context of relevant calculations	Level 2	3	Registered
Fundamental	9007 Work with a range of patterns and functions and solve problems	Level 2	5	Registered
Fundamental	12444 Measure, estimate and calculate physical quantities and explore, describe and represent geometrical relationships in 2-dimensions in different life or workplace contexts	Level 2	3	Registered
Fundamental	12461 Communicate at work	Level 2	5	Registered
Fundamental	12465 Develop a learning plan and a portfolio for assessment	Level 2	6	Registered
Fundamental	13217 Collect and use information	Level 2	5	Registered
Fundamental	14085 Apply basic knowledge of statistics in order to investigate life and work related problems	Level 2	3	Registered



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:

National Certificate: Electrical Engineering

SAQA QUAL ID	QUALIFICATION TITLE	
48474	National Certificate: Electrical Engineering	
SGB NAME	SGB Electrical Engineering & Construction	
ABET BAND	PROVIDER NAME	
Undefined		
QUALIFICATION CODE	QUAL TYPE	SUBFIELD
PPC-4-National Certificate	National Certificate	Electrical Infrastructure Construction
MINIMUM CREDITS	NQF LEVEL	QUALIFICATION CLASS
130	Level 4	Regular-Unit Stds Based
SAQA DECISION NUMBER	REGISTRATION START DATE	REGISTRATION END DATE

PURPOSE OF THE QUALIFICATION

This qualification will allow a person to advance through learning to an electrical engineering and energy related qualification at NQF level 5. The core and required elective unit standards provide credits that allow access to both vertically and horizontally articulated qualifications. This qualification will enhance the social status, productivity and employability of the learner within the electrical engineering and energy sector and contribute to the quality, production rate and growth of the electrical engineering and energy sector. Through the critical crossfield component of the qualification, learners are able to demonstrate vocational skills through which they are able to engage in life skills activities, small business development, health and environmental issues.

A person acquiring this qualification will have skills, knowledge and experience to:

- > Evaluate and apply essential methods to technical operational systems.
- > Analyse and apply acquired knowledge in performing the tasks and solve common problems.
- > Gather and analyse relevant information, use data to apply theories and principles within electrical engineering related situations.
- > Execute role and responsibilities by being able to summarise, classify, discuss and estimate application processes required through mathematical concepts, technical and schematic diagrams, computer and technology usage in a range of different contexts.
- > Communicate with peers, customers and members of supervisory/management levels by presenting information reliably and accurately in spoken and written form.

Rationale of the qualification

This is the third occupational based qualification in a series for learners that reflect the workplace-based needs of the electrical engineering and energy field that is expressed by employers and employees, both now and for the future. This qualification provides the learner with accessibility to be employed within the electrical engineering and energy field and provides the flexibility to pursue different careers in the broader electrical engineering and energy sector.

For those who have acquired experience in the workplace, this qualification represents part of the RPL process to acknowledge workplace skills acquired without the benefit of former education or training.

RECOGNIZE PREVIOUS LEARNING?

Y

LEARNING ASSUMED TO BE IN PLACE

NQF 3 or equivalent and competence in the following:

- > Occupational health, safety and environmental practices within the electrical environment.
- > Use and maintenance of hand tools, power tools and measuring instruments.
- > Communication and Language.

Recognition of prior learning

This qualification may be obtained through Recognition of Prior Learning (RPL). The learner should be thoroughly briefed on the mechanism to be used and support and guidance should be provided. Care should be taken that the mechanism used provides the learner with an opportunity to demonstrate competence and is not so onerous as to prevent learners from taking up the RPL option towards gaining a qualification.

QUALIFICATION RULES

The rules of combination for this Qualification:

The Fundamental component of NQF Level 2-4 Qualifications for achieving a National Certificate requires a minimum of twenty credits for the "Communication and Language Studies" category and sixteen credits for the "Mathematics and Science" category. These qualifications also require a minimum of 120 credits in total in order to obtain a Certificate.

A candidate will receive a FET certificate for this qualification if the Unit Standards for Communication and Language Studies are also completed in any other recognised second language.

This Qualification's Fundamental, Core and Elective components are made up as follows:

Fundamental Unit Standards:

- > The "Communication and Language Studies" category contains 23 Credits and the "Mathematics and Science" category 19 Credits. This amounts to 42 Credits for the Fundamental component of the Qualification.

Core Unit Standards:

- > This amounts to 73 credits.

Elective Unit Standards:

- > This amounts to 180 Credits of which a minimum of fifteen Credits must be done.

The total Credits for this Qualification are 295 Credits of which a minimum of 130 Credits must be done to achieve a Certificate.

EXIT LEVEL OUTCOMES

1. Evaluate and apply essential methods to technical operational systems, by using procedures and equipment required in the electrical field that meet quality and output requirements, working safely in an environmental friendly manner.
2. Analyse and apply acquired knowledge in performing the tasks and solve common problems related to the electrical field within familiar contexts.
3. Gather and analyse relevant information, use data to apply theories or principles within electrical engineering situations and work in a disciplined manner.

ASSOCIATED ASSESSMENT CRITERIA

- 1.1 Knowledge and skills regarding technical operational systems on three phase circuits are demonstrated and problems solved according to maintenance procedures.
- 1.2 Knowledge and understanding regarding personal safety practices in an industrial or domestic electrical engineering and energy environment is applied according to standard operating procedures and safety requirements.

2.1 Knowledge and skills to install, commission and maintain three phase AC- and DC systems and control gear are demonstrated according to relevant procedures.

2.2 Knowledge and skills to design three phase electrical systems are demonstrated according to specialised contexts requirements and relevant procedures.

3.1 Electrical engineering sketches and drawings are evaluated and analysed in contexts with electrical engineering situations.

3.2 Data is used, theories and principles applied to do fault finding and repairs on three phase electrical systems and control gear.

3.3 Relevant information is gathered, analysed and data used to maintain electrical equipment and three phase systems.

Integrated Assessment

The applied competence (practical, foundational and reflective competencies) of this qualification will be achieved if a learner is able to achieve all exit level outcomes of the qualification.

The identification and solving of problems, team work, organising self, using of technical diagrams, implication of actions and reactions in the world as a set of related systems must be assessed during any combination of practical, foundational and reflexive competencies assessment methods and tools to determine the whole person development and integration of applied knowledge and skills.

- > Certain exit level outcomes are measurable and verifiable through assessment criteria assessed in one application.
- > Applicable assessment tool(s) to establish the foundational, reflective and embedded knowledge to problem solving and application of the world as a set of related systems within the electrical installation and maintenance environment.
- > A detailed portfolio of evidence is required to proof the practical, applied and foundational competencies of the learner.
- > Assessors and moderators should develop and conduct their own integrated assessment by making use of a range of formative and summative assessment methods. Assessors should assess and give credit for the evidence of learning that has already been acquired through formal, informal and non-formal learning and work experience.
- > Summative assessment should also encompass achievement of the competence described both in individual unit standards, exit level outcomes as well as the integrated competence described in the qualification.

Unit standards associated with the qualification must be used to assess specific and critical cross-field outcomes.

During integrated assessments the assessor should make use of formative and summative assessment methods and should assess combinations of practical, applied, foundational and reflective competencies.

INTERNATIONAL COMPARABILITY

This Qualification is benchmarked against international standards and qualifications. The unit standards on which this qualification is based were compared with unit standards from New Zealand, Australia and Scotland in terms of their range of electrical qualifications, unit standard titles, specific outcomes, assessment criteria and degree of difficulty.

This Qualification has been compiled to be more generic to the entire low-and high voltage electrical engineering, construction and renewable energy industry with special emphases on three phase industrial and high voltage installations. The qualifications for the above mentioned countries are subdivided into different domains of the low voltage electrical engineering field, with very little evidence of high voltage applications.

The overall scope of the other countries' Unit Standards for the electrical field has been adequately covered in the core requirement of this qualification. The focus and complexity level of the core Units Standards compares very well, but the upliftment of literacy, numeracy and social skills have been emphasized more in the fundamental requirement of this Qualification to redress the inequalities of the past. More credits are therefore needed for this level than what is required for similar international levels.

The core-and elective unit standards of this qualification are more focused on the practical application, with the theoretical requirements built into the embedded knowledge. Only a few Unit Standards focus on theory but they are written more generically than those of the other countries. The international Qualifications on the other hand, included more knowledge-based Unit Standards with less credits linked to it.

ARTICULATION OPTIONS

This qualification will allow a person to advance to learning for an electrical engineering certificate at NQF level 5. This qualification provides the learner with the flexibility to pursue different careers in the electrical industry and articulation within the engineering industries. The level of flexibility within the range of elective will allow the individual to pursue further learning within an entrepreneurship, supervision/management, quality assurance, health and safety and engineering contexts.

MODERATION OPTIONS

- > Anyone assessing a learner or moderating the assessment of a learner against this Qualification must be registered as an assessor with the relevant ETQA.
- > Any institution offering learning that will enable the achievement of this Qualification must be accredited as a provider with the relevant ETQA.
- > Assessment and moderation of assessment will be overseen by the relevant ETQA according to the ETQAs policies and guidelines for assessment and moderation; in terms of agreements reached around assessment and moderation between ETQAs (including professional bodies); and in terms of the moderation guideline detailed immediately below.
- > Moderation must include both internal and external moderation of assessments at exit points of the qualification, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described both in individual unit standards, exit level outcomes as well as the integrated competence described in the qualification.

Anyone wishing to be assessed against this Qualification may apply to be assessed by any assessment agency, assessor or provider institution that is accredited by the relevant ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

Assessors need experience in the following areas:
Interpersonal skills, subject matter and assessment.

The assessor needs to be competent in planning, conducting and providing feedback on assessment of learning outcomes and in the design and development of assessments as described in the unit standards. The assessor should at least be competent at the same level or be at a level above this level 4 Qualification with at least two years of practical experience in the electrical engineering or related environment. The assessor must comply with the criteria set by the relevant ETQA.
The subject matter experience of the assessor can be established by recognition of prior learning.

Assessors need to be registered with the relevant Education and Training Quality Assurance Body.

NOTES

Qualification review and linkages:

This Qualification is part of a review of four registered ones called "General Education and Training Certificate in Basic Technical Practice (Energy) - NQF Level 1" and "National Certificates in Electrical Engineering - NQF Level 2-4".

During the review it was found that the registered "General Education and Training Certificate in Basic Technical Practice (Energy) - NQF Level 1" is too specific to the electrical engineering and construction environment, instead of being more generic to the entire electrical engineering and electrical engineering and energy industry. Its Elective component mainly contains Unit Standards that should be part of the NQF

Level 2 Qualification. The registered Qualifications for NQF Levels 1-4 also contain a lot of Unit Standards that were designed specifically for multi-skilling persons within the mechanical trade, of which some are too activity based.

There shall be a clear link between the currently registered and the new proposed Qualifications in the sense that many of the Unit Standards shall be the same, but shall be placed differently in mainly the Core component of the Qualifications. This is done to achieve a more progressive build-up from an entry level for the electrical industry at NQF 2, single-phase installations at NQF 3, through to more complex Unit Standards such as those for three phase installations at NQF 4. Renewable energy shall also be part of the Elective component of these Qualifications.

The future GETC Qualification for Basic Technical Practice (Energy) at NQF Level 1 shall be mainly knowledge-based and shall be a generic entry level for the entire electrical engineering and electrical engineering and energy industry.

All the activity-based Unit Standards shall not be part of the new Qualifications, but shall be replaced with new Elective Unit Standards that are required by the different electrical industries.

UNIT STANDARDS

(Note: A blank space after this line means that the qualification is not based on Unit Standards.)

	UNIT STANDARD ID AND TITLE	LEVEL	CREDITS	STATUS
Core	113839 Demonstrate an understanding of basic programmable logic controllers	Level 3	10	Draft - Prep for P Comment
Core	10257 Design and Construct a Three Phase Circuit	Level 4	5	Registered
Core	10259 Fault find, repair and maintain three phase voltage electrical circuits	Level 4	8	Registered
Core	10262 Maintain and repair three phase AC machines and control gear	Level 4	12	Registered
Core	10264 Install and commission three phase AC machines and control gear	Level 4	8	Registered
Core	10266 Wire and commission three phase electrical circuits	Level 4	8	Registered
Core	113873 Understand basic electrical and mechanical engineering principles	Level 4	8	Draft - Prep for P Comment
Core	113894 Test and inspect a three phase industrial/commercial installation	Level 4	10	Draft - Prep for P Comment
Core	113969 Apply the principles of energy efficiency	Level 4	6	Draft - Prep for P Comment
Elective	13657 Install and commission direct current (DC) machines	Level 3	8	Registered
Elective	13818 Maintain low voltage switchgear	Level 3	6	Registered
Elective	113884 Fault find and repair a stand-alone battery charging wind turbine	Level 3	5	Draft - Prep for P Comment
Elective	113885 Lower, inspect service and maintain a stand-alone battery charging wind turbine	Level 3	5	Draft - Prep for P Comment
Elective	13681 Inspect, test and maintain high voltage isolators	Level 4	12	Registered
Elective	13682 Maintain direct current (DC) machines	Level 4	5	Registered
Elective	113862 Install and terminate Medium/High Voltage cables	Level 4	6	Draft - Prep for P Comment
Elective	113874 Joint Medium / High Voltage cables	Level 4	8	Draft - Prep for P Comment
Elective	113878 Spray-wash energised medium / high voltage networks	Level 4	4	Draft - Prep for P Comment
Elective	113880 Inspect, test and maintain Medium / High Voltage transformers	Level 4	6	Draft - Prep for P Comment
Elective	113881 Inspect, maintain, repair and do faultfinding on Medium / High Voltage networks	Level 4	8	Draft - Prep for P Comment
Elective	113882 Inspect, test and maintain Medium / High Voltage earthing systems	Level 4	4	Draft - Prep for P Comment
Elective	113883 Install / replace high voltage equipment and hardware	Level 4	6	Draft - Prep for P Comment
Elective	113888 Design a stand alone renewable energy system	Level 4	10	Draft - Prep for P Comment
Elective	113890 Design a wind/solar hybrid system	Level 4	5	Draft - Prep for P Comment

Elective	113892 Design a solar pump system	Level 4	4	Draft - Prep for P Comment
Elective	113895 Maintain high voltage transformer unit protection	Level 4	6	Draft - Prep for P Comment
Elective	113896 Evaluate a distribution board	Level 4	10	Draft - Prep for P Comment
Elective	113897 Troubleshoot on programmable logic controllers	Level 4	5	Draft - Prep for P Comment
Elective	113898 Issue certificate of compliance for a single phase domestic installation	Level 4	5	Draft - Prep for P Comment
Elective	113900 Operate on Medium Voltage radial networks	Level 4	20	Draft - Prep for P Comment
Elective	113901 Demonstrate an understanding of process communication systems	Level 4	8	Draft - Prep for P Comment
Elective	113969 Inspect, record and report condition of Medium / High Voltage station apparatus and related equipment	Level 4	6	Draft - Prep for P Comment
Elective	113970 Construct and commission Medium / High Voltage networks	Level 4	6	Draft - Prep for P Comment
Fundamental	7485 Demonstrate understanding of real and complex number systems	Level 4	3	Registered
Fundamental	8974 Engage in sustained oral communication and evaluate spoken texts	Level 4	5	Registered
Fundamental	8975 Read, analyse and respond to a variety of texts	Level 4	5	Registered
Fundamental	8976 Write for a wide range of contexts	Level 4	5	Registered
Fundamental	9014 Use mathematics to investigate and monitor the financial aspects of personal, business and national issues	Level 4	6	Registered
Fundamental	9015 Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life related problems	Level 4	6	Registered
Fundamental	9502 Write a technical report	Level 4	4	Registered
Fundamental	9506 Communicate in an assertive manner with clients and fellow workers	Level 4	4	Registered
Fundamental	12417 Measure, estimate & calculate physical quantities & explore, critique & prove geometrical relationships in 2 and 3 dimensional space in the life and workplace of adult with increasing responsibilities	Level 4	4	Registered



Established in terms of Act 58 of 1995

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:

National Certificate: Electrical Engineering

SAQA QUAL ID	QUALIFICATION TITLE	
48475	National Certificate: Electrical Engineering	
SGB NAME	SGB Electrical Engineering & Construction	
ABET BAND	PROVIDER NAME	
Undefined		
QUALIFICATION CODE	QUAL TYPE	SUBFIELD
PPC-3-National Certificate	National Certificate	Electrical Infrastructure Construction
MINIMUM CREDITS	NQF LEVEL	QUALIFICATION CLASS
129	Level 3	Regular-Unit Stds Based
SAQA DECISION NUMBER	REGISTRATION START DATE	REGISTRATION END DATE

PURPOSE OF THE QUALIFICATION

This Qualification will allow a person to advance through learning to an electrical Qualification at NQF level 3. The core and required elective Unit Standards provide credits that allow access to both vertically and horizontally articulated Qualifications. This Qualification will enhance the social status, productivity and employability of the learner within the electrical engineering and energy sector and contribute to the quality, production rate and growth of the electrical engineering and energy sector.

Through the critical crossfield component of the Qualification, learners are able to demonstrate vocational skills through which they are able to engage in life skills activities, small business development, health and environmental issues. Through recognition of prior learning adult learners are encouraged to access basic education with an understanding that they already have knowledge and experience.

A person acquiring this Qualification will have skills, knowledge and experience to:

- > Identify and apply technical operational systems.
- > Summarise, interpret information and use knowledge in performing the tasks.
- > Organise information and use data, apply theories or principles to electrical engineering situations.
- > Execute role and responsibilities by being able to summarize, classify, discuss and estimate application processes required through mathematical and theoretical concepts, technical and schematic diagrams, computer and technology usage in a range of different contexts.
- > Communicate with peers, customers and members of supervisory / management levels by expressing opinions in spoken and written form.

Rationale of the Qualification

This is the second occupational based Qualification in a series for learners that reflect the workplace-based needs of the electrical field that is expressed by employers and employees, both now and for the future. This Qualification provides the learner with accessibility to be employed within the electrical field and provides the flexibility to pursue different careers in the broader electrical engineering and energy sector and articulate within the Engineering, Electrical Construction, Generation, Transmission and Distribution specialization contexts. It also provides the Learner with enough knowledge and skills to pursue small business opportunities within the private sector through which the private sector and the economy can benefit.

For those who have acquired experience in the workplace, this Qualification represents part of the RPL process to acknowledge workplace skills acquired without the benefit of former education or training.

RECOGNIZE PREVIOUS LEARNING?

Y

LEARNING ASSUMED TO BE IN PLACE

NQF 2 or equivalent and competence in the following:

- > Occupational health, safety and environmental practices within the electrical environment
- > Use of hand tools, power tools and measuring instruments
- > Mathematics, Communication and language

Recognition of prior learning

This Qualification may be obtained in whole or in part through RPL. The learner should be thoroughly briefed on the mechanism to be used and support and guidance should be provided. Care should be taken that the mechanism used provides the learner with an opportunity to demonstrate competence and is not so onerous as to prevent learners from taking up the RPL option towards gaining a Qualification.

QUALIFICATION RULES

The rules of combination for this Qualification:

The Fundamental component of NQF Level 2-4 Qualifications for achieving a National Certificate requires a minimum of twenty credits for the "Communication and Language Studies" category and sixteen credits for the "Mathematics and Science" category. These qualifications also require a minimum of 120 credits in total in order to obtain a Certificate.

This Qualification's Fundamental, Core and Elective components are made up as follows:

Fundamental Unit Standards:

The "Communication and Language Studies" category contains 28 Credits and the "Mathematics and Science" category 23 Credits. This amounts to 51 Credits for the Fundamental component of the Qualification.

Core Unit Standards:

This amounts to 68 credits.

Elective Unit Standards:

This amounts to 90 Credits of which a minimum of ten Credits must be done.

The total Credits for this Qualification is 212 Credits of which a minimum 129 Credits must be done to achieve a Certificate.

EXIT LEVEL OUTCOMES

1. Identify and apply technical operational systems, by using procedures and equipment required in the electrical field that meet quality and output requirements, working safely in an environmental friendly manner.
2. Summarise, interpret information and use knowledge in performing the tasks related to electrical field or specialised contexts.
3. Organise information and use data, to apply theories and principles to within electrical engineering situations and work in a disciplined manner under supervision when necessary.

ASSOCIATED ASSESSMENT CRITERIA

- 1.1 Knowledge and skills regarding technical operational systems on single phase AC- and DC in industrial and domestic circuits are demonstrated and problems solved according to maintenance procedures.
- 1.2 Knowledge and understanding regarding personal safety practices in an industrial or domestic electrical engineering and energy environment is applied according to standard operating procedures and safety requirements.
- 2.1 Knowledge and skills to install, commission and maintain single phase AC- and DC systems and control gear are demonstrated according to relevant procedures.

2.2 Knowledge and skills to clean and repair electrical equipment are demonstrated according to requirements and relevant procedures.

3.1 Electrical engineering sketches and drawings are identified and interpreted in contexts with electrical engineering situations

3.2 Data is used, theories and principles applied to do fault finding and repairs on AC- and DC systems and control gear

3.3 Information is selected, organised and data used to maintain electrical equipment and single phase systems.

Integrated Assessment

The applied competence (practical, foundational and reflective competencies) of this Qualification will be achieved if a learner is able to achieve all exit level outcomes of the Qualification.

The identification and solving of problems, team work, organising self, using of technical diagrams, implication of actions and reactions in the world as a set of related systems must be assessed during any combination of practical, foundational and reflective competencies assessment methods and tools to determine the whole person development and integration of applied knowledge and skills.

> Certain exit level outcomes are measurable and verifiable through assessment criteria assessed in one application.

> Applicable assessment tool(s) to establish the foundational, reflective and embedded knowledge to problem solving and application of the world as a set of related systems within the electrical installation and maintenance environment.

> A detailed portfolio of evidence is required to proof the practical, applied and foundational competencies of the learner.

> Assessors and moderators should develop and conduct their own integrated assessment by making use of a range of formative and summative assessment methods. Assessors should assess and give credit for the evidence of learning that has already been acquired through formal, informal and non-formal learning and work experience.

> Summative assessment should also encompass achievement of the competence described both in individual Unit Standards, exit level outcomes as well as the integrated competence described in the Qualification.

Unit Standards associated with the Qualification must be used to assess specific and critical cross-field outcomes. During integrated assessments the assessor should make use of formative and summative assessment methods and should assess combinations of practical, applied, foundational and reflective competencies.

INTERNATIONAL COMPARABILITY

This Qualification Benchmarked against international standards and Qualifications.

The Unit Standards on which this Qualification is based were compared with Unit Standards from New Zealand, Australia and Scotland in terms of their range of electrical Qualifications, Unit Standard titles, specific outcomes, assessment criteria and degree of difficulty.

This Qualification has been compiled more generic to the entire low-and high voltage electrical engineering, construction and renewable energy industry with special emphases on single phase domestic installations. The Qualifications for the above mentioned countries are subdivided into different domains of the low voltage electrical engineering field. However, the overall scope of the other countries' Unit Standards for the electrical field has been adequately covered in this Qualification. The focus and complexity level of the core units standards compares very well, but the upliftment of literacy, numeracy and social skills have been emphasized more in the fundamental requirement of this Qualification to redress the inequalities of the past. More credits are therefore needed for this level than what is required for similar international levels.

The core-and elective Unit Standards of this Qualification are more focused on the practical application, with the theoretical requirements built into the embedded knowledge. Only a few standards focus on theory, but

is written more generically than those of the other countries. The international Qualifications on the other hand, included more knowledge-based Unit Standards with less credits linked to it. Unit Standard Qualification Unit Standard.

ARTICULATION OPTIONS

This Qualification will allow a person to advance to learning for an electrical engineering Qualification at NQF level 4. This Qualification provides the learner with the flexibility to pursue different careers in the electrical engineering and energy industry and articulation within the engineering industries. The level of flexibility within the range of electives will allow the individual to pursue further learning within an entrepreneurship, supervision / management, quality assurance, health and safety and engineering contexts.

MODERATION OPTIONS

- > Anyone assessing a learner or moderating the assessment of a learner against this Qualification must be registered as an assessor with the relevant ETQA.
- > Any institution offering learning that will enable the achievement of this Qualification must be accredited as a provider with the relevant ETQA.
- > Assessment and moderation of assessment will be overseen by the relevant ETQA according to the ETQAs policies and guidelines for assessment and moderation; in terms of agreements reached around assessment and moderation between ETQAs (including professional bodies); and in terms of the moderation guideline detailed immediately below.
- > Moderation must include both internal and external moderation of assessments at exit points of the Qualification, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described both in individual Unit Standards, exit level outcomes as well as the integrated competence described in the Qualification.

Anyone wishing to be assessed against this Qualification may apply to be assessed by any assessment agency, assessor or provider institution that is accredited by the relevant ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

Assessors need experience in the following areas:

Interpersonal skills, subject matter and assessment.

The assessor needs to be competent in planning, conducting and providing feedback on assessment of learning outcomes and in the design and development of assessments as described in the Unit Standards. The assessor should at least be competent at the same level or be at a level above this level 3 Qualification with at least two years of practical experience in the electrical engineering or related environment. The assessor must comply with the criteria set by the relevant ETQA.

The subject matter experience of the assessor can be established by recognition of prior learning.

Assessors need to be registered with the relevant Education and Training Quality Assurance Body.

NOTES

Qualification review and linkages:

This Qualification is part of a review of four registered ones called "General Education and Training Certificate in Basic Technical Practice (Energy) - NQF Level 1" and "National Certificates in Electrical Engineering - NQF Level 2-4".

During the review it was found that the registered "General Education and Training Certificate in Basic Technical Practice (Energy) - NQF Level 1" is too specific to the electrical engineering and construction environment, instead of being more generic to the entire electrical engineering and energy industry. Its Elective component mainly contains Unit Standards that should be part of the NQF Level 2 Qualification. The registered Qualifications for NQF Levels 1-4 also contain a lot of Unit Standards that were designed specifically for multi-skilling persons within the mechanical trade, of which some are too activity based.

There shall be a clear link between the currently registered-and the new proposed Qualifications in the sense that many of the Unit Standards shall be the same, but shall be placed differently in mainly the Core component of the Qualifications. This is done to achieve a more progressive build-up from an entry level for the electrical industry at NQF 2, single phase installations at NQF 3, through to more complex Unit Standards such as those for three phase installations at NQF 4. Renewable energy shall also be part of the Elective component of these Qualifications.

The future GETC Qualification for Basic Technical Practice (Energy) at NQF Level 1 shall be mainly knowledge-based and shall be a generic entry level for the entire electrical engineering and energy industry.

All the activity-based Unit Standards shall not be part of the new Qualifications, but shall be replaced with new Elective Unit Standards that are required by the different electrical industries.

UNIT STANDARDS

(Note: A blank space after this line means that the qualification is not based on Unit Standards.)

	UNIT STANDARD ID AND TITLE	LEVEL	CREDITS	STATUS
Core	10260 Install and commission electrical metering units or measuring instruments and control devices	Level 3	5	Registered
Core	10261 Install and Commission Single Phase AC Machines and Control Gear	Level 3	8	Registered
Core	10265 Wire and commission domestic electrical circuits	Level 3	8	Registered
Core	10269 Maintain lighting System	Level 3	4	Registered
Core	10270 Construct Basic Electronic Circuits	Level 3	4	Registered
Core	13791 Fault find on single phase alternating current (AC) systems	Level 3	8	Registered
Core	14134 Maintain and repair single phase AC machines and control gear	Level 3	6	Registered
Core	14135 Repair and maintain electric power tools	Level 3	3	Registered
Core	113893 Test and inspect a single phase domestic installation	Level 3	10	Draft - Prep for P Comment
Core	114388 Install, joint and terminate Low Voltage cables and conductors	Level 3	8	Draft - Prep for P Comment
Core	114406 Understand basic electronic theory and components	Level 3	4	Draft - Prep for P Comment
Elective	10234 Install low voltage transformers	Level 2	6	Registered
Elective	10244 Maintain and repair a high voltage security fence system	Level 2	4	Registered
Elective	113864 Inspect service and maintain a photovoltaic supplied pump	Level 2	2	Draft - Prep for P Comment
Elective	113871 Install and commission photovoltaic supplied pump	Level 2	3	Draft - Prep for P Comment
Elective	113886 Install Medium Voltage transformers	Level 2	6	Draft - Prep for P Comment
Elective	10258 Design and Install Electrical Wire Ways	Level 3	8	Registered
Elective	10268 Fault Find, Test and Repair Domestic Appliances	Level 3	6	Registered
Elective	113865 Operate on low voltage networks	Level 3	12	Draft - Prep for P Comment
Elective	113866 Inspect, test, maintain and repair Low / Medium voltage networks	Level 3	8	Draft - Prep for P Comment
Elective	113869 Fault find a photovoltaic supplied system	Level 3	8	Draft - Prep for P Comment
Elective	113875 Inspect, operate and maintain high mast lighting structures	Level 3	7	Draft - Prep for P Comment
Elective	113889 Perform work on energised low voltage networks	Level 3	8	Draft - Prep for P Comment
Elective	113891 Install / replace mini substations and ring-main units / switches	Level 3	6	Draft - Prep for P Comment
Elective	113902 Install batteries	Level 3	4	Draft - Prep for P Comment
Fundamental	7572 Demonstrate knowledge of and produce computer spreadsheets using basic functions	Level 2	3	Registered
Fundamental	7792 Maintain data in a computer system	Level 2	4	Registered

Fundamental	8968 Accommodate audience and context needs in oral communication	Level 3	5	Registered
Fundamental	8969 Interpret and use information from texts	Level 3	5	Registered
Fundamental	8970 Write texts for a range of communicative contexts	Level 3	5	Registered
Fundamental	8973 Use language and communication in occupational learning programmes	Level 3	5	Registered
Fundamental	9010 Demonstrate an understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	Level 3	2	Registered
Fundamental	9011 Use mathematics to investigate and monitor the financial aspects of personal and business issues	Level 3	5	Registered
Fundamental	9012 Investigate life and work related problems using data and probabilities	Level 3	5	Registered
Fundamental	9013 Describe, apply, analyse and calculate shape and motion in 2-and 3-dimensional space in different contexts	Level 3	4	Registered
Fundamental	9960 Communicate verbally and non-verbally in the workplace	Level 3	5	Registered



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

1

Maintain transformers

SAQA US ID	UNIT STANDARD TITLE		
113858	Maintain transformers		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 2	5
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector

A person credited with this unit standard will be capable of:

Maintaining transformers according to manufacturer specifications and to prevent breakdowns and loss of operation (service).

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Relevant sections in statutory requirements
- > Select, use and care for basic hand tools
- > Introduction to industry
- > Standard lay out drawings
- > Power tools (portable)
- > Terminology associated with transformers and components
- > Working principles associated with transformers/components
- > Basic safety procedures related to the type of work and location

UNIT STANDARD RANGE

- > Maintenance is limited to Transformer Types covered by statutory requirements
- > Maintenance is restricted to cleaning, Inspecting and replacing consumable items

Transformers include:

- > Oil Filled Type
- > Dry Type

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan the work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Planning is arranged according to manufacturers specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Planning is integrated with other disciplines and associated equipment. Range: Protection testing and monitoring, engineering, operating and control centers.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Planning is aligned with maintenance programs and schedules.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Planning is arranged according to plant availability and customer requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Prepare to maintain transformers.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Equipment, tools and personal protective equipment needed for maintenance is selected, inspected and checked for functionality and safety prior to commencement of tasks.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Inspection reports, checklist, tools, equipment, spares, work site and work task.

ASSESSMENT CRITERION 2

2. All components and material required for maintaining transformer is correctly identified, selected and available for use.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Task instructions, process or procedures are obtained and correctly interpreted. (Permits and work orders)

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Work site hazards are identified and the appropriate action is taken in line with work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. The safety aspects pertaining to maintenance are described as per Occupational Health and Safety Act requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Maintain transformers.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Personal protective equipment is used and site specific safety procedures are adhered to throughout maintenance according to safe work procedures. Range: Isolations, lockout systems and permits.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The correct site approved cleaning materials and solvents are utilised during maintenance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Silica gel cartridge and oil bowl is removed and contents replaced as per manufacturers specifications and site procedures. Range: Silica gel breathers, seals and termination box covers.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Transformer is cleaned according to site-specific standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Task instructions, process or procedures are followed correctly.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Work area is cleaned after completion of task in line with housekeeping standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. Waste materials are disposed of according to site specific standards and procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The impact on the environment of hazardous substances used during transformer maintenance is explained and the disposal method is described or demonstrated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Human safety and environmental management.

ASSESSMENT CRITERION 4

4. Quality checks are conducted after maintenance and necessary corrective action is taken according to quality assurance procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Equipment and tools used for maintenance is cleaned and checked for functionality and stored on completion of task.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Knowledge that will help me understand and that I will be able to explain:

- > Terminology associated with transformers.
- > Working principles of transformers.
- > Operating principles of transformers

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems (deviations from statutory requirements are identified, reported and rectified).

UNIT STANDARD CCFO WORKING

Work effectively with others (affected parties are liased with and informed).

UNIT STANDARD CCFO ORGANIZING

Organise and manage oneself (plan, select, organise work tasks).

UNIT STANDARD CCFO COLLECTING

Collect, organise and critically evaluate information (worksite preparation).

UNIT STANDARD CCFO COMMUNICATING

Communicate (affected parties are liased with and informed).

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary information:

Specified requirrements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > SABS Specifications
 - > OHS Act, No 85 OF 1993
 - > Manufacturer's manuals
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

2

Apply soldering techniques

SAQA US ID	UNIT STANDARD TITLE		
113863	Apply soldering techniques		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 2	2
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector. A person credited with this unit standard will be capable of: Light duty lead soldering

This unit standard will contribute to the full development of the learner within the electrical engineering and Construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Introduction to safety
- > Engineering hand tools.

UNIT STANDARD RANGE

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Appropriate hand tools are identified and selected to meet the requirements of the job Range: Side cutters, long nose pliers, set of jewellers screwdrivers, wire stripper and small files.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Appropriate hand tools are used safely to meet the requirements of the job according to worksite procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Unsafe and faulty tools are identified and marked for repair or replacement according to set procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Applicable test equipment is selected and checked for functionality.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Prepare For soldering.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

3. Personal protective equipment is used as per Occupational Health and Safety Act and worksite regulations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

4. Correct lead solder selected as required by task.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Bars, ingots, pastes and solder wire.

ASSESSMENT CRITERION 3

1. Work area is inspected for safe working conditions and corrective action is taken where required.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

2. Applicable soldering equipment selected as required by task.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Soldering iron (gas, electrical, battery), soldering stations and Solder sucker.

SPECIFIC OUTCOME 3

Perform soldering.

OUTCOME NOTES**OUTCOME RANGE**

Straight wire to wire connection Solder connection to solder tag Screened cable to a connector (audio jack)
Multi core cable to a multi pin connector.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. Applicable tools and equipment are selected and used safely to meet the requirements of the job.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. All connections are cleaned from any dirt or oxidation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Tinning of connections done according to manufacturers specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Connections soldered according to set specifications/techniques.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete the work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Work area is cleaned after completion of task in line with housekeeping standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Waste materials are disposed of according to site specific standards and procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Reason for the application of the disposal method is given. Human safety and environmental management.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Hand tools are cared for, maintained and stored according to worksite procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant

ETQA.

2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Relevant sections of statutory requirements.
- > Handling and application of jointing kits.
- > Working principles of applicable equipment and components.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identify and solve problems.

UNIT STANDARD CCFO WORKING

Work effectively with others as a member of a team or group.

UNIT STANDARD CCFO ORGANIZING

UNIT STANDARD CCFO COLLECTING

UNIT STANDARD CCFO COMMUNICATING

Communicate effectively by means of language skills, oral and/or written.

UNIT STANDARD CCFO SCIENCE

UNIT STANDARD CCFO DEMONSTRATING

UNIT STANDARD CCFO CONTRIBUTING

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

N/A



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

3

Identify, handle and assemble Low Voltage hardware and related materials

SAQA US ID	UNIT STANDARD TITLE		
113870	Identify, handle and assemble Low Voltage hardware and related materials		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 2	4
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons working in the Low Voltage installation environment.

A person credited with this unit standard will be able to identify, handle and assemble Low Voltage hardware, equipment and related materials.

This unit standard will contribute to the full development of the learner.

The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within Geographical Information Sciences environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and/or equivalent:

- > Basic hand tools
- > Apply safety in an electrical environment
- > Personal protective equipment
- > Housekeeping (including stacking & storing)
- > Environmental awareness

UNIT STANDARD RANGE

This unit standard applies to persons working with, handling and assembling LV hardware, equipment and related materials independently.

- > Hardware will include, but are not limited to wire ways, conductors, cables/jointing kits, distribution boards, inspection boxes, termination lugs, connectors, glands, insulators, clips, saddles, straps, adapters, light fittings, screws, bolts and washers.
- > Equipment will include, but are not limited to isolators, fuses, switches, miniature circuit breakers, earth leakage units, load controllers, relays, transformers, surge arrestors.
- > Related material will include, but are not limited to insulation tapes, glues, lubricants, thread cutting oil.
- > Assembly will include, but is not limited to assembling of wire ways, jointing kits, glands, distribution boards and light fittings.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Identify and handle the appropriate Low Voltage hardware.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Instructions are interpreted and carried out as per job requirement.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Hardware identified as per instruction.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Personal protective equipment worn when handling hardware as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Hardware selected and handled as per work instruction / manufacturer's requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Identify and handle the appropriate Low Voltage equipment.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Instructions are interpreted and carried out as per job requirement.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. Equipment identified as per instruction.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Personal protective equipment worn when handling hardware as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Hardware selected and handled as per work instruction/manufacture's requirements, applying basic rigging principles if required.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Assemble Low Voltage hardware.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Work site/area prepared according to worksite procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Personal protective equipment worn when assembling hardware as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Assemble hardware in logical sequence as per manufacturer's specifications and job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. Work site/area to be left in order as per environmental legislation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Identify and handle related Low Voltage materials.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Related materials identified as per job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Environmental requirements of applicable related materials are adhered to.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Personal protective equipment worn when handling related materials as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Related materials selected and handled as per manufacturer's specifications and job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Waste materials disposed of as per environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A basic understanding of assembling the relevant hardware.
- > A broad understanding of the application and purpose of hardware and related materials.
- > A basic understanding of the relevant procedures and practices relating to handling and assembling.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING****UNIT STANDARD CCFO COLLECTING**

Collect, evaluate, organise and critically evaluate information related to LV electrical hardware and related material so that these are accurately interpreted into application performance standards.

UNIT STANDARD CCFO COMMUNICATING**UNIT STANDARD CCFO SCIENCE****UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Specified Requirements:

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > OHS Act
 - > Environmental Act
 - > ISO Standards
 - > SABS 0142
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

4

Inspect and clean electrical machines

SAQA US ID	UNIT STANDARD TITLE		
113876	Inspect and clean electrical machines		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 2	4
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the electrical engineering and maintenance environment. A person credited with this unit standard will be able to inspect and clean electrical machines.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Introduction to industry (work environment)
- > Statutory requirements
- > Identify, inspect and clean electrical machines
- > Basic safety within the electrical environment
- > Selection and use of applicable tools
- > Use of electrical test instruments

UNIT STANDARD RANGE

1. Electrical machines may include but not limited to:

- > AC motors and alternators
- > DC motors and generators

2. Cleaning may include but not limited to:

- > Washing of frame
- > Blowing out machines with compressed air
- > Cleaning of slip rings

3. Electrical inspection may include but not limited to inspection of:

- > Earthing according to SANS 10142 - 1
- > Terminations / hot connections
- > Brushes

- > Brush gear
- > Brush pressure
- > Commutator
- > Terminal marks

4. Mechanical inspection may include but not limited to inspection of:

- > Check frame for cracks
- > Bearings
- > Couplings
- > Base mounting / bolts
- > Cooling fan / forced cooling
- > Cowling if applicable
- > Terminal box

5. Statutory requirements are included but are not limited to SANS 10142 - 1, OSH Act

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan work and prepare work area.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Job instructions are interpreted according to worksite procedures.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. Job instructions are communicated with the team leader.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. Personal protective equipment is selected, examined and used in a manner that protects the individual.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 4

4. Tools, material, work platforms and equipment are selected and transported to the work site.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. The work site is examined for hazardous and sub-standard conditions. Critical hazards and sub-standard conditions encountered in a particular context are addressed.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Affected parties are informed and liased with according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Clean and inspect AC machines.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The machines to be cleaned and inspected are verified.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Personal protective equipment, tools, materials, work platforms, special work platforms (if necessary) and consumables are effectively used to carry out the job.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. AC machine(s) are cleaned and inspected according to job instructions and work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. Safety, good housekeeping and environmental practices are followed before, during and after performance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Clean and inspect DC machines.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The machines to be cleaned and inspected are verified.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Personal protective equipment, tools, materials, work platforms, special work platforms (if necessary) and consumables are effectively used to carry out the job.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. DC machine(s) are cleaned and inspected according to job instructions and work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Safety, good housekeeping and environmental practices are followed before, during and after performance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 4

Complete activity.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Documentation is completed and processed according to company procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Personal protective equipment, tools, DC machine components, materials, work platforms, recyclable material and unused/half used consumables are stored according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Scrap material is disposed off according to company standards and procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Work area is restored to a clean and safe condition according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Completion of job is reported according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

> A broad understanding of occupational health, safety and environmental statutory requirements pertaining to

the activity

- > A comprehensive understanding of applicable worksite procedures
- > A basic understanding of applicable manufacturers' specifications

Knowledge that will help me understand and that I will be able to explain:

- > Applicable work site procedures
- > Job instructions
- > Documentation required for the activity
- > Communication and teamwork principles
- > Reporting systems
- > Ingress protection rating
- > Identification, location and function of appropriate tools, personal protective equipment and consumables
- > Effect of poisonous, toxic and dangerous materials on the human body
- > Names and functions of electrical machines
- > Construction of electrical machines
- > Working principles of electrical machines are theoretically and practically explained as well as scientifically and mathematically proven
- > Uses of electrical machines

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identify and solve problems (Identification of defects)

UNIT STANDARD CCFO WORKING

Work effectively with others (Organise material schedules with team members)

UNIT STANDARD CCFO ORGANIZING

Organise and manage oneself (Select and organise documentation and equipment)

UNIT STANDARD CCFO COLLECTING

Collect, analyse, organise and critically evaluate information (Adhere to manufacturer specifications)

UNIT STANDARD CCFO COMMUNICATING

Communicate (Reporting of defects)

UNIT STANDARD CCFO SCIENCE

Use science and technology (Environmental and personal safety)

UNIT STANDARD CCFO DEMONSTRATING

Understand the world as a set of related systems communicate (Know the consequences of incorrect using of products)

UNIT STANDARD CCFO CONTRIBUTING

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

Supplementary

Specified Requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of

the following documents:

- > NZ 2395
- > OHS Act

Glossary of Terms

- > AC machines may include but are not limited to:
 - > Three phase squirrel cage induction motor
 - > Three phase slip-ring motor
 - > Synchronous machine
 - > Single phase squirrel cage induction motor
 - > Universal motor
 - > Multi-speed motor

DC machines may include but are not limited to:

- > Series
 - > Shunt
 - > Compound - Accumulative / Differential
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

5

Understand fundamentals of electricity

SAQA US ID		UNIT STANDARD TITLE		
113877		Understand fundamentals of electricity		
SGB NAME		ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction		Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION		
Physical Planning and Construction		Electrical Infrastructure Construction		
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC		Regular	Level 2	8
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER	

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector

A person credited with this unit standard will be capable of:

- > Explaining the atom theory
- > Explaining the effect of magnetism on a moving conductor
- > Understanding the generation and distribution of electricity
- > Stating Ohm's law and the application of it.
- > Understanding batteries as a source of electricity
- > Understanding, building and calculating the effect of electricity in series, parallel and series parallel circuits.
- > Protecting circuits and balancing the load.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment. This unit standard is a pre requisite for registration as an accredited person and does not give the learner the legal right to issue a Certificate of Compliance. The registering authority will do registration as an accredited person. This unit standard may not cover the Explosion industry.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > GETC certificate NQF level 1
- > Fundamentals on a NQF 2 qualification. Numeracy and literacy.

UNIT STANDARD RANGE

The range of this theoretical unit standard will include but are not limited to:

1. Explanation of one electron revolving around a nucleus.
2. Movement of electrons in a conductor.
3. Current flow through a single load.
4. Generation of electricity by means of the three basic conditions, movement, magnetism and conduction.

5. Potential difference (V) and electromotive force (EMF).
6. Rules and characteristics of magnetic lines.
7. Conversion of fuels into electrical energy.
8. Direct current generators and alternators.
9. Copper and aluminium conductors.
10. Insulating material commonly used in the electrical field.
11. Definition and application of Ohm's law with regard to Voltage, Current, Resistance and Power.
12. Circuit protection includes fuses, circuit breakers and overload relays.
13. Relevant sections of the SABS 0142-1 code of practice.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Demonstrate an understanding of the fundamentals of electricity.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Define electricity.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Explain and demonstrate the movements of electrons.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Explain the effect of an external power source on the electrons in a conductor.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Demonstrate an understanding of the current flow in a circuit.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 2

Differentiate between permanent and temporary magnets.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Explain the lines of force flowing outside a permanent magnet.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Define induction by a magnetic field.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Explain the production of electricity by using a conductor that moves in a magnetic field.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Define conductors and insulators.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Types and properties of conductors.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Characteristics and uses of conductors.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Types and properties of insulators.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Characteristics and uses of insulators.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Demonstrate an understanding of the generation and distribution of electricity.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Electricity by means of a chemical reaction. Primary and secondary cells.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Conversion of fuels into energy.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Single phase generators.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Single phase alternators.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 5

Define and apply Ohm's law.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. List the SI units for Energy, Volts, Current, Resistance and Power complete with the quantity symbol, unit and unit symbol.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Describe the base units for Kilo, Milli and Mega complete with its symbol and exponent.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. List and draw the following symbols for circuits: Lamp; fuse; galvanometer; cell; circuit breaker; conductor; coil; battery; capacitor; dc power source; voltmeter; ac power source; ammeter; switch; ohmmeter; resistance; wattmeter and kilowatt-hour meter.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Define Ohm's Law.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Ohm's law formula as far as volts, resistance, current and power is concerned.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 6

6. Calculations in the following circuits. Total resistance; Current through each resistance; voltage over each resistance and power consumed by each resistance in:

- > Series
- > Parallel
- > Series / parallel

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. Difference between power and energy.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 8**

8. Balance circuits to avoid volt drop and overloading at certain sections.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 6**

Define and apply circuit protection.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Fuses and their characteristics and purpose.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Connection of fuses in a circuit.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Single phase circuit breakers and their characteristics.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. Connection of circuit breakers in a circuit.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Overload relays and their characteristics.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Connection of overload relays in a circuit.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Knowledge of the SABS 0142-1 code of practice pertaining to this unit standard.
- > Manipulation of formulas.
- > Definition of Ohm's law and the application of it.
- > Use and care for conductors and insulators.
- > Safety around batteries.
- > Safety when working with electricity.
- > Dangers of short circuits and loose connections.
- > Relevant sections of the OSH-act.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems using critical and innovative thinking to make responsible decisions.

UNIT STANDARD CCFO WORKING

Work effectively with others during experiments.

UNIT STANDARD CCFO ORGANIZING

Organise and manage oneself.

UNIT STANDARD CCFO COLLECTING

Collect, organise and critically evaluate information.

UNIT STANDARD CCFO COMMUNICATING

Communicate effectively using visual, mathematical and language skills.

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information:

Specified Requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > SABS 0142-1
- > Occupational Health & Safety Act (Act 85 of 1993)

Applicable statutory requirements

A glossary of terms about the terminology of

Context Specific

User manuals supplied manufacturers

Specifications, agreements and policies and procedures



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

6

Install luminaires

SAQA US ID	UNIT STANDARD TITLE		
113879	Install luminaires		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 2	4
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector

A person credited with this unit standard will be able to:

- > Explain the requirements pertaining to the installation of luminaires
- > Prepare to install a luminaire
- > Install the luminaires
- > Prepare and test the luminaires for operation

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Introduction to industry and operational area
- > Apply and adhere to electrical safety
- > Identify, interpret and lay out of drawings
- > Use and care for hand tools
- > Use and care for portable power tools
- > Record instrument readings
- > Select, use and care for electrical measuring instruments
- > Install electrical cables and conductors
- > Interpret single-phase diagrams
- > Joint and fault trace cables.

UNIT STANDARD RANGE

The work done will be according to the appropriate of the following specifications, standards and/or procedures:

- > Statutory requirements
- > Work site procedures
- > Manufacturer specifications

Equipment may include but are not limited to:

- > Luminaires for use in the domestic, learning institution and office environment
- > Luminaires for use in the industrial environment
- > Luminaires for use in hazardous areas
- > Luminaires for street lighting
- > Luminaires for emergency lighting
- > Luminaires for use in the sport field environment
- > Cables
- > Glands

Lamps may include but are not limited to:

- > Incandescent lamps (GLS, Tungsten halogen, compact sources)
- > Low pressure mercury vapour lamps (Switch start, Semi-resonant, Rapid start, Slimline, Compact fluorescent)
- > High intensity discharge lamps (Metal Halide, High Pressure Mercury Vapour, High Pressure Sodium, Low pressure Sodium)

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Explain the requirements pertaining to the selection and methods of installation.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. The reason for selecting of equipment/components according to cable type, cable size, voltage-, current-, wattage-, frequency rating and insulating material are given.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. The impact of size and type of light fittings are explained.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. The method of cable termination is explained.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 4

4. The applicable method of installation is explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. The regulations applicable to the installation of luminaires are explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Prepare to install a luminaire.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Appropriate documentation is acquired.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Job instructions are communicated with the team leader.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Personal protective equipment is selected and examined in a manner that protects the individual.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Tools, material, work platforms and equipment are selected and transported to the work site.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 5

5. The work site is examined for hazardous and sub-standard conditions. Critical hazards and sub-standard conditions encountered in a particular context are addressed.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. The installation specifications are verified.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. The consequences of not preparing to install in line with specified requirements are explained with reference to personal and team safety, impact on the environment, production costs and lost time.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Install the luminaire.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Hazards and risks directly related to installing a luminaire are identified and addressed.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The luminaire is installed.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

This includes mounting, wiring, termination, etc.

ASSESSMENT CRITERION 3

3. Safety, good housekeeping and correct environmental practices are followed before, during and after performance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. The consequences of not installing a luminaire in line with specified requirements are explained with reference to personal and team safety, impact on the environment, production costs and lost time.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Prepare and test the luminaire for operation.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The luminaire is tested to ensure compliance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

This includes continuity, earth continuity, insulation, etc.

ASSESSMENT CRITERION 2

2. The luminaire is connected to the power.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Tools, material, work platforms and equipment are cleaned, inspected and stored or disposed.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The feedback report complies with specified requirements for format, contents, accuracy and distribution. The report is delivered within the agreed time.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. The consequences of not reporting and performing housekeeping duties in line with specified requirements are explained with reference to personal and team safety, impact on the environment, production costs and lost time.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Knowledge that will help me understand and that I will be able to explain:

- > SHERQ statutory requirements for activity
- > Applicable work site procedures
- > Applicable manufacturers' specifications
- > Documentation required for the activity
- > Communication and teamwork principles
- > Reporting systems
- > Identification, location and function of appropriate tools, material, personal protective equipment and work platforms
- > Names and functions of components used in the installation process
- > Ingress protection ratings
- > Installation procedures
- > Fault finding principles

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems in testing, fault finding, repairing and rectifying faults

UNIT STANDARD CCFO WORKING

Work effectively with others in reporting test results to superior

UNIT STANDARD CCFO ORGANIZING

Organise and manage oneself in planning the work and determining a sequence of operation

UNIT STANDARD CCFO COLLECTING

Collect, analyse, organise and critically evaluate information obtained during testing, fault finding, repairing and rectifying faults

UNIT STANDARD CCFO COMMUNICATING

Communicate with superior readings obtained, the interpretation and reporting of test results

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information

Specified Requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > SABS 0142
- > OSH Act
- > Statutory requirements

Glossary of Terms

Communications and teamwork principles may include but are not limited to:

- > Questions and answers
- > Discussions
- > Depending on the help of somebody else to do a job

Documentation may include but are not limited to:

- > Checklists
- > Job cards

Environmental practices may include but are not limited to correct methods of disposing of material containing:

- > Galvanise
- > Silicon
- > Cadmium
- > Fiberglas

Fault finding principles may include but are not limited to methods of discovering:

- > Broken luminaire bowls, hinges, seals, mountings
- > Sharp edges on damaged luminaires
- > Wrong wiring and termination
- > The use of wrong equipment/components

Good housekeeping practices may include but are not limited to practices given by:

- > NOSA
- > Work site procedures

Hazardous and sub-standard conditions may include but are not limited to:

- > Luminaires above moving machinery
- > Broken components with sharp edges that is to be removed
- > Equipment blocking the work area
- > Uneven surfaces onto which luminaires to be secured

Ingress protection rating may include but are not limited to:

- > Protection of persons against access to hazardous parts
- > Protection against water
- > Mechanical protection

Installing procedure may include but are not limited to:

- > Manufacturers' maintenance manuals
- > Company maintenance manuals

Job instruction may include but are not limited to instructions from:

- > Job cards
- > Team leader (Verbal instructions)

Maintenance procedure may include but are not limited to:

- > Manufacturers' maintenance manuals
- > Company maintenance manuals

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PART 2 OF 2



AIDS HELPLINE: 0800-0123-22 Prevention is the cure

Manufacturers' specifications may include but is not limited to:

- > Dimensions of components
- > Weight of components

Type of material from which components were manufactured as given in:

1. Manufacturers' maintenance manuals
2. Manufacturer catalogues
3. Company maintenance manuals

Materials may include but are not limited to:

- > Bolts and nuts
- > Rawl bolts
- > Angle iron and/or flat bar
- > Strapping
- > Grinding discs
- > Welding rods
- > Cleaning agents
- > Stationary
- > Scrap paper
- > Boxes

Personnel protective equipment may include but are not limited to:

- > Safety glasses
- > Safety belts
- > Visors
- > Helmets

Personal safety may include but are not limited to:

- > Assuring safe conditions as given by NOSA
- > Acting safely as given by NOSA

Poisonous, toxic and dangerous materials may include but are not limited to:

- > Fiberglass
- > Galvanise

Cadmium? Policy procedure may include but are not limited to:

- > Methods of communicating
- > Methods of completing documentation
- > Methods of selecting personal safety equipment, tools, consumables, etc.
- > Checklists

Practical safety may include but are not limited to:

- > Using of personnel protective equipment

Reporting system may include but is not limited to:

- > Documentation (electronic or paper)
- > Verbal feedback

Safety will include but are not limited to:

- > Personal safety
- > Practical safety
- > Safety on equipment

Safety on equipment will include but are not limited to:

- > Mechanical hazards poised by luminaires
- > Hazards when disposing of damaged luminaires and / or luminaire mounting components

Safety will include but are not limited to:

- > Personal safety
- > Practical safety

> Safety on equipment

Safety on equipment will include but are not limited to:

- > Mechanical hazards posed by luminaires
- > Hazards when disposing of damaged luminaires and / or luminaire mounting components

Statutory requirements may include but is not limited to:

- > OHS Act,
- > SABS 0142, and
- > Local Authority requirements

Tools may include but are not limited to:

- > Hand tools
- > Power tools
- > Measuring instruments (Electrical and Mechanical)

Work platforms may include but are not limited to:

- > Stepladders
- > Ladders
- > Scaffolding
- > Telescoping scaffolding
- > Lift truck

Work site may include but are not limited to:

- > Domestic, learning institution and office environments
- > Industrial environments
- > Gas and/or dust hazardous areas (Petrol stations, etc.)
- > Streets
- > Sport field environments

Work site procedures may include but are not limited to Company's:

- > Safety procedures as given in Safety manuals
- > Policy procedures as given in Policy manuals
- > Installing procedures as given in Manufacturers' and Company maintenance manuals
- > Maintaining procedure given in Manufacturers' and Company maintenance manuals



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

7

Fault find and repair a stand-alone battery charging wind turbine

SAQA US ID	UNIT STANDARD TITLE		
113884	Fault find and repair a stand-alone battery charging wind turbine		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 3	5
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the electrical engineering and industrial environment. A person credited with this unit standard will be capable of:

Finding, repairing faults and maintaining a stand-alone battery charging wind turbine according to applicable drawings and statutory requirements to ensure continuous operation.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Electrical safety.
- > Electrical drawings.
- > Hand tools.
- > Application of electrical testing instruments.
- > Install wire and commission a stand-alone photovoltaic supplied system.
- > Power tools.

UNIT STANDARD RANGE

- > Statutory requirements includes but are not limited to
 - a. OSH Act, SABS.
 - b. Authority requirements.
 - c. Manufacturers specification and worksite procedure.

- > Electrical drawing include but is not limited to:

- a. Schematic diagrams.
- b. Wiring diagrams.
- c. Connection/terminal connections.
- d. Cable schedules.
- e. Layout drawings and floor/building plans.

> Fault finding and maintenance covers AC and DC.

> Electrical components include but are not limited to:

Panels, contactors, relays, timers, push buttons, selector switches, indication lights, protective devices (fuses, circuit breakers, surge arrestors, overload devices) connection terminals, wiring, fixed electrical measuring instruments and auxiliary equipment (voltmeter, ammeter, etc), permanent magnet 3 phase AC alternator, DC generator

> Electrical testing instruments include but are not limited to:

- a. Multimeter.
- b. Insulation tester.
- c. Impedance tester.

> Tools include but are not limited to:

- a. Gripping.
- b. Cutting.
- c. Turning.
- d. Striking.
- e. Power tools.

> Safety and good house keeping practices are adhered to before, during and after performance.

> Worksite/work area, etc.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan to fault find and maintain a stand-alone battery charging wind turbine.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Planning is done according to prescribed manufacturers manuals.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. Planning is integrated with other disciplines and associated equipment.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. Planning is arranged according to equipment operating history reports and failure rate.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Planning is aligned with maintenance schedules.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Planning is arranged according to customer requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Prepare to maintain a stand-alone battery charging wind turbine.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Correct / applicable electrical circuit layout wiring diagrams and manufacturers manuals are obtained as per job instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Isolation points of electrical circuits identified as per circuit diagrams.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Isolation undertaken safely and according to worksite / stand-alone battery charging wind turbine supplied system procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. Safe isolation of electrical circuits verified against job instructions and safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Safety and / or security lockout systems applied according to worksite procedures and safety practices.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Reasons for having isolation points in certain areas explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. The importance of verification when isolating circuits explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 8**

8. Location and purpose of installing warning signs to be explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Find and repair faults on a stand-alone battery charging wind turbine.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Sequence of operation is determined as per job instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. Applicable safety equipment is selected and used according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Applicable testing instruments and tools are selected according to job and applicable statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Wind turbine and peripheral circuitry operation is observed to identify possible causes of faults in accordance with manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Applicable circuit drawings are interpreted according to possible causes of faults identified in relation to applicable circuit drawings to determine corrective action.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Faultfinding is done by making use of a logical method according to fault finding techniques.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. Fault finding results are recorded and reported according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 8**

8. Faults that endanger life corrected immediately.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 9

9. Applicable tools, equipment, materials and components to rectify faults are selected according to job requirements and work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 10**

10. Faults are safely repaired according to work site procedures and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Maintain a stand-alone battery charging wind turbine.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Applicable safety equipment is selected and used according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Applicable testing instruments, tools, drawings, equipment, material and components are selected according to job and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Electrical circuits are correctly identified and selected according to schedule/instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Electrical circuits are safely maintained according to statutory requirements to prevent breakdowns and loss of operation/service.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 5

Complete the work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Work area is cleared and cleaned on completion of task according to housekeeping requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Waste materials disposed of according to site specific standards, procedures and environmental policies.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Electrical circuits re-commissioned on completion of task as per operational standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Quality checks conducted and corrective action taken where required as per quality standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Panel / enclosure doors, covers properly secured or locked to restrict unauthorised access as per safety standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Lockout devices and warning signs removed.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 7

7. Job cards / work orders and check sheets correctly completed and maintenance reports submitted.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

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2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A comprehensive understanding of the relevant legislation, authority requirements, procedures and practices
- > A broad understanding of a stand-alone battery charging wind turbine.
- > A comprehensive understanding of electrical faultfinding procedures.
- > A basic understanding of electrical protection systems.

Knowledge that will help me understand and that I will be able to explain:

- > Fault finding methods and procedures.
- > Applicable worksite procedures.
- > Electrical isolating procedures.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems (Identify faults).

UNIT STANDARD CCFO WORKING**UNIT STANDARD CCFO ORGANIZING**

Organise and manage oneself (Selection of applicable tools, equipment drawing material and components. Planning and organising).

UNIT STANDARD CCFO COLLECTING

Collect, analyse, organise and critically evaluate information (Analyse faults).

UNIT STANDARD CCFO COMMUNICATING

Communicate (Writing of reports).

UNIT STANDARD CCFO SCIENCE

Use science and technology (Using measuring instruments and discriminate).

UNIT STANDARD CCFO DEMONSTRATING**UNIT STANDARD CCFO CONTRIBUTING**

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

Supplementary Information:

Specified Requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > OHS Act.
 - > Manufacturer's plant specifications.
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

8

Test and inspect a single phase domestic installation

SAQA US ID		UNIT STANDARD TITLE		
113893		Test and inspect a single phase domestic installation		
SGB NAME		ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction		Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION		
Physical Planning and Construction		Electrical Infrastructure Construction		
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC		Regular	Level 3	10
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER	

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector.

A person credited with this unit standard will be capable of:

- > Conducting an electrical test and inspection of a domestic single-phase installation to ensure compliance with all statutory requirements and that they have been applied to the installation.
- > Using appropriate test instruments and understanding the indicated results.
- > Using appropriate inspection documents.
- > Completing the appropriate inspection documents with correct and relevant information.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment. This unit standard is a pre requisite for registration as an accredited person and does not give the learner the legal right to issue a Certificate of Compliance. The registering authority will do registration as an accredited person. This unit standard may not cover the Explosion Industry.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Wire and commission domestic electrical circuits
- > Assessed working knowledge of: SABS 0142-1
- > Have awareness of the application of statutory regulations to the installation.

UNIT STANDARD RANGE

- > Statutory requirements may include but are not limited to the Occupational Health & Safety Act (Act 85 of 1993), SABS Regulations, Mineral Act, Local Authority requirements, Manufacturers specifications and Worksite procedures
- > Domestic installations may include but are not limited to houses, flats and townhouse complexes and such, where the supply to the premises is single phase in both rural and urban environments.
- > Test equipment may include but are not limited to multimeters, insulation tester, clip on ammeter, impedance testing equipment, earth leakage testing devices, earth electrode resistance testing equipment, continuity testers, and any others appropriate to single phase installations.
- > Inspection documents may include but are not limited to, check lists, records, installation schedules, electrical drawings, plans and circuit diagrams.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan Work to be done appropriate to the installation environment and the required task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Job instructions are interpreted and a sequence of operations is determined.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Appropriate tools, equipment and instruments are identified and selected to meet the requirements of the task according to statutory and environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Acquire the correct documentation necessary to complete the task as per data management requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Understanding the statutory requirements for the task, including but not limited to safety rules and regulations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Hazards and risks are identified according to environmental standards and safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 2

Testing The Installation in accordance with the statutory requirements.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Permission is obtained to carry out task as per local requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Installation is tested according to the statutory requirements from the code.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Appropriate documentation is completed as per data management requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Appropriate Test instruments used competently to obtain meaningful readings.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Understanding of the measurements obtained from the test is demonstrated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. All safety precautions are observed and demonstrated during the test procedure.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 3

Inspect The Installation in accordance with the statutory requirements.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Permission is obtained to carry out task as per local requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The installation is inspected for compliance to the statutory and environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Appropriate documentation for the type of installation is completed.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Understanding of any non-compliant components within the installation is demonstrated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. All safety requirements are observed and demonstrated during the inspection.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete the required test and inspection documentation.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. All personnel, tools, instruments and access equipment have been removed from the installation according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The work area is restored to its original condition on completion of the test / inspection procedures as per safety requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Demonstrate that the certificate of compliance is correctly and accurately completed according to applicable SABS requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The results of the inspection and test be communicated to all concerned as per reporting procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. A defect list is compiled and corrective action taken if necessary.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Assessed working knowledge of SABS 0142-1 (Latest edition) and the Occupational Health & Safety Act (Act 85 of 1993)
- > Inspection documents and check lists pertaining to a single phase installation including the contents of a Certificate of Compliance
- > Understand the concepts of a single phase installation and its environment

Knowledge that will help me understand and that I will be able to explain:

- > Types of material/equipment that may be used in electrical installations
- > Appropriate Fault finding techniques for a single phase installation

- > Important factors affecting the safety of the installation for the user
- > The importance of accurately recording data and test results
- > The importance of understanding the SABS 0142-1 code in order to recognise defects and their specific relationship to the code requirements for installed electrical equipment.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems (identification of defects).

UNIT STANDARD CCFO WORKING

Work effectively with others (during the testing and inspection of an installation).

UNIT STANDARD CCFO ORGANIZING

Organise and manage oneself (identification and selection of electrical equipment in the installation).

UNIT STANDARD CCFO COLLECTING

Collect, analyse, organise and critically evaluate information (during the inspection and testing of the installation).

UNIT STANDARD CCFO COMMUNICATING

Communicate (reporting of defects).

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING**

Interpretation of statutory requirements.

UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary information

Specified requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

> SABS 0142-1

> Occupational Health & Safety Act (Act 85 of 1993)

Applicable statutory requirements

A glossary of terms about the terminology of

Context specific

User manuals supplied manufacturers

() system

Specifications, agreements and policies and procedures.



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

9

Demonstrate an understanding of basic programmable logic controllers

SAQA US ID	UNIT STANDARD TITLE		
113899	Demonstrate an understanding of basic programmable logic controllers		
SGB NAME	ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction	Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 3	10
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Demonstrate an understanding of basic programmable logic controllers.

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and/or equivalent:

- > Safety procedures according to statutory and manufacturer requirements
- > Induction to industry
- > Basic computer literacy
- > Basic understanding of electricity
- > Basic digital electronics

UNIT STANDARD RANGE

- > Type of PLC's used include but is not limited to block PLC's, modular PLC's, screw mounted PLC's, din rail PLC's.
- > The range of PLC equipment includes but is not limited to central processing unit, input modules, output modules, power supply, back plane.
- > Programming languages appropriate to the PLC used include but are not limited to Ladder, STL and SFC.
- > Safety precautions include the use of personal protective equipment, electrical and fire protection, process isolation.
- > Statutory requirements include but are not limited to SABS, OSH Act and manufacturers specifications.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Demonstrate an understanding of the input/output peripherals.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The correct peripheral is identified (input/output, discrete, digital, analogue, intelligent).

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The manuals/specifications and drawings are selected according to the peripheral.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Hazards associated with the use of are recognised and necessary precautions taken according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The correct operation of the peripheral device must be demonstrated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. The peripherals are correctly removed and replaced according to manufactures specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 2

Demonstrate an understanding of field devices interfaced to programmable logic controllers.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The correct field device is identified (pushbuttons, limits, level, pressure devices).

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The operation of the field device is verified.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The field device is correctly connected to the appropriate peripheral.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Personal safety equipment is selected according to activity requirement.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Demonstrate an understanding of the processor in a programmable logic controller.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The functions of the indicator lights of the processor are explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. The battery of the processor is correctly identified, removed & replaced according to manufactures specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Faults are correctly diagnosed by utilising the indicator lights.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The processor mode switch is correctly identified and utilized according to the task instruction.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Communication status indicators are correctly identified and the status correctly explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Demonstrate an understanding of the back plane and power supply of a programmable logic controller.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Placement of the programmable logic peripherals and processor on the back plane are correct according to the address structure of the back plane.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Correct addressing modes are selected on the back plane for the peripheral modules selected.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Correct insertion of the power supply is carried out according to manufactures specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Correct connections for redundant power supply have been made.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 5**

Demonstrate an understanding of the programming terminal.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Handheld or programming terminal must be correctly connected to the processor.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Communication between the programmer and the processor must be established.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The correct sequence must be used to monitor on-line the programme that resides in the processor.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Instruction mnemonics are explained with reference to the field devices.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Workshop procedures including house keeping practices according to statutory requirements.
- > Specific work site safety practices relating to the use of power tools including the use of personal protective equipment, electrical and fire protection.
- > Names, locations and functions of pressure equipment and their accessories.
- > Hazards and preventive precautions associated with pressure equipment.
- > Company quality standards.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO ORGANIZING

UNIT STANDARD CCFO COLLECTING

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty pressure equipment and interpreting job requirements.

UNIT STANDARD CCFO SCIENCE

UNIT STANDARD CCFO DEMONSTRATING

UNIT STANDARD CCFO CONTRIBUTING

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

N/A



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

10

Understand basic electrical and mechanical engineering principles

SAQA US ID	UNIT STANDARD TITLE		
113873	Understand basic electrical and mechanical engineering principles		
SGB NAME	ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction	Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 4	8
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission; Construction and Renewable Energy Sectors.

A person credited with this unit standard will be able to:

Demonstrate and understanding of electrical and mechanical engineering technologies.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > An understanding of the metric numbering system.
- > A basic knowledge of physics.
- > A basic knowledge of unit conversion.

UNIT STANDARD RANGE

This unit standard includes but is not limited to:

- > Electrical and mechanical engineering quantities the applications thereof.
- > The principles of magnetism, electromagnetism and electric fields.
- > The principles of AC and DC power generation (single and 3 phase).
- > AC theory (resistance, voltage, current, frequency, r.m.s. values, capacitance, inductance, reactance, power, var and power factor).
- > DC circuit theory and network analysis.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Use and describe SI, energy, electrical and mechanical quantities correctly.

OUTCOME NOTES**OUTCOME RANGE**

Force, torque, work done, velocity, acceleration, angular velocity, power, current, quantity of electricity, voltage, potential difference, electromotive force, electrical power, resistance, resistivity, temperature coefficient of resistance and conductivity.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. Quantities are converted to their correct SI units.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Energy, electrical and mechanical units are defined and its symbols listed correctly.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The difference between power energy and kWh is explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Basic battery theory is understood in terms of e.m.f., internal resistance, Ahr, Whr., and terminal voltage with the aid of basic calculations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Resistance, voltage and current of single-and three phase, pure resistive AC circuits are measured and power calculated with the aid of Ohms law.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 2

Understand and use DC theory and network analysis in solving RLC circuits.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Series circuits with one supply are drawn and explained in relation with voltage, current and resistance values.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Parallel circuits with one supply are drawn and explained in relation with voltage, current and resistance values.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Series-and parallel circuits with one supply are drawn and explained in relation with voltage, current and resistance values.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Basic calculations of RLC circuits are done with the application of Kirchoff's laws.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Understand and apply magnetic theory.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. The laws of magnetic flux lines are defined in relation with the principles of magnetism.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Magnetic fields in various magnetic circuits are described in relation with the principles of electromagnetism.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Toroid, core type, shell type and composite.

ASSESSMENT CRITERION 3

3. The direction of magnetic fields is determined and described with reference to screening, leakage and fringing.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Magnetic units are named and applied with the aid of basic calculations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Flux, flux density, magnetomotive force, magnetic field strength, permeability of free space, relative permeability, reluctance, length of a magnetic circuit and the cross sectional area of a magnetic circuit.

SPECIFIC OUTCOME 4

Understand electromagnetic theory.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Magnetic fields produced by coils and conductors are described and sketched.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Flemmings left and right hand rules are defined and applied.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Lenz's law is defined and applied.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Induced e.m.f and rate of change are understood and applied.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Basic calculations related to electromagnetic theory are carried out.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 5**

Understand capacitance theory.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The operation of a capacitor is described in relation with different types and sizes.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Capacitance units are named and applied in relation with different types and sizes.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Electric field strength, electric flux density, permittivity of free space, dielectric, dielectric strength, relative permittivity and capacitance.

ASSESSMENT CRITERION 3

3. The relationship between capacitance and relevant variables are described.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. Basic calculations relevant to capacitance theory are carried out.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 6**

Understand alternating current theory.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The difference between AC and DC is described with reference to the various generation machine configurations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The principle of how AC e.m.f. is generated, is described as per AC theory principles.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Factors influencing the value of alternating voltage and current are described as per AC theory principles.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. AC units are described and applied as per AC theory principles.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Cycle, frequency, wavelength, amplitude, peak and maximum values, peak to peak value, sine wave, electrical degrees, r.m.s. and average values.

ASSESSMENT CRITERION 5

5. Factors influencing frequency are described as per AC theory principles.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 6

6. Basic calculations related to capacitance, inductance, reactance, impedance, power vars and power factor theory is carried out and explained as per AC theory principles.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Knowledge that will help me understand and that I will be able to explain:

- > An understanding of electrical theory.
- > A basic understanding of physics.
- > A basic understanding of applied mechanics.
- > A basic understanding electron theory.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems (Identify factors which impact on the performance of electrical and mechanical engineering technologies.).

UNIT STANDARD CCFO WORKING**UNIT STANDARD CCFO ORGANIZING**

Organise and manage oneself (Understand and manage electrical concepts and principles.).

UNIT STANDARD CCFO COLLECTING**UNIT STANDARD CCFO COMMUNICATING**

Communicate (Describe basic electrical and mechanical engineering principles.).

UNIT STANDARD CCFO SCIENCE

Use science and technology (Understanding electrical and mechanical theory and principles.).

UNIT STANDARD CCFO DEMONSTRATING

Understand the world as a set of related systems (Understand electrical and mechanical theory and principles in relation to other disciplines.).

UNIT STANDARD CCFO CONTRIBUTING

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

Supplementary Information:

Specified Requirements

> Voltage control theory.

A glossary of terms about the terminology of context specific:

- > AC - Accumulating Current.
 - > Ahr - Ampere-hour.
 - > DC - Direct current.
 - > e.m.f. - Electromotive force.
 - > RLC - Resistance / inductance / capacitance.
 - > r.m.s. - Root-mean-square.
 - > Var - Reactive volt-ampere.
 - > Whr - Watt-hour.
-



Established in terms of Act 58 of 1995

SOUTH AFRICAN QUALIFICATIONS AUTHORITY**UNIT STANDARD:**

11

Test and inspect a three phase industrial/commercial installation

SAQA US ID		UNIT STANDARD TITLE		
113894		Test and inspect a three phase industrial/commercial installation		
SGB NAME		ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction		Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION		
Physical Planning and Construction		Electrical Infrastructure Construction		
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC		Regular	Level 4	10
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER	

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector.

A person credited with this unit standard will be capable of:

- > Conducting an electrical test and inspection of a three phase industrial/commercial installation to ensure compliance with all statutory requirements and that they have been applied to the installation.
- > Using appropriate test instruments and understanding the indicated results.
- > Using appropriate inspection documents.
- > Completing the appropriate inspection documents with correct and relevant information.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment. This unit standard is a pre requisite for registration as an accredited person and does not give the learner the legal right to issue a Certificate of Compliance. The registering authority will do registration as an accredited person. This unit standard may not cover the Explosion Industry.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and/or equivalent:

- > Wire and commission three phase electrical circuits
- > Tested knowledge of: SABS0142-1
- > Have awareness of the application of statutory regulations to the installation

UNIT STANDARD RANGE

- > Statutory requirements may include but are not limited to OSH Act, SABS Regulations, Mineral Act, Local Authority requirements, Manufacturers specifications and Worksite procedures.
- > Three phase commercial/industrial installations may include but are not limited to office buildings, factories, shops and townhouse complexes and such, where the supply to the premises is three phase in both rural and urban environments.
- > Test equipment may include but are not limited to multimeters, insulation tester, clip on ammeter, impedance testing equipment, earth leakage testing devices, earth electrode resistance testing equipment, continuity testers, phase rotation meters and any others appropriate to three phase industrial/commercial installations.

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> Inspection documents may include but are not limited to, check lists, records, installation schedules, electrical drawings, plans and circuit diagrams.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan the electrical installation tests to be done.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Job instructions are interpreted and a sequence of operations is determined according to the installation environment and the required task.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Appropriate tools, equipment and instruments are identified and selected to meet the requirements of the task according to statutory and environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The correct documentation necessary to complete the task is obtained as per data management requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The safety rules and regulations regarding the task is understood according to statutory requirements and safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Environmental hazards and safety risks are identified according to environmental standards and safety risk analyses.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 2

Test the electrical installation.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Permission is obtained to carry out task as per local authorisation procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Installation is tested according to the statutory requirements from the wiring code.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Appropriate documentation is completed as per data management system requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Appropriate test instruments used competently to obtain meaningful readings.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. The measurements obtained from the test is understood and demonstrated in context with the wiring code specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. All safety precautions are observed and demonstrated during the test as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 3

Inspect the electrical installation.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Permission is obtained to carry out task as per local authorisation procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The Installation is inspected for compliance according to statutory and environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Appropriate documentation for the type of installation is completed as per data management system requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Any non-compliant components within the installation is identified and understood in relation with the wiring code requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. All safety requirements are observed during the inspection as per industry standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete the required test and inspection documentation.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. All personnel, tools, instruments and access equipment have been removed from the installation as per work site-and safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The work area is restored to its original condition and is safe for use as per industry requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The results of the inspection and test is communicated and processed as per data management system requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. A report and where necessary, a defect list is compiled on the inspection and test as per industry requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Tested knowledge of SABS 0142-1 (Latest edition) and the Occupational Health & Safety Act (Act 85 of 1993).
- > Inspection documents and check lists pertaining to a three phase commercial/industrial installation including the contents of a Certificate of Compliance.
- > Understand the concepts of a three phase commercial/industrial installations and its environment.

Knowledge that will help me understand and that I will be able to explain:

- > Types of material/equipment that may be used in electrical installations.
- > Appropriate fault finding techniques for a three phase commercial/industrial installation.
- > Important factors affecting the safety of the installation for the user.
- > The importance of accurately recording data and test results.
- > The importance of understanding the SABS 0142-1 code in order to recognise defects and their specific relationship to the code requirements for installed electrical equipment.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify defects and solve problems.

UNIT STANDARD CCFO WORKING

Work effectively with others during the testing and inspection of an installation.

UNIT STANDARD CCFO ORGANIZING

Organise and manage oneself during the identification and selection of electrical equipment for the installation.

UNIT STANDARD CCFO COLLECTING

Collect, analyse, organise and critically evaluate information during the inspection and testing of the installation

UNIT STANDARD CCFO COMMUNICATING

Communicate and report defects.

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING**

Interpretation of statutory requirements.

UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information:

Specified Requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

> SABS 0142-1

> Occupational Health & Safety Act (Act 85 of 1993)



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

12

Repair and service small gas appliances

SAQA US ID	UNIT STANDARD TITLE		
113859	Repair and service small gas appliances		
SGB NAME	ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction	Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 2	4
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector.

A person credited with this unit standard will be capable of:

- > Fault find, test and repair gas appliances.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

- > Safety precautions when working on gas appliances
- > OSH Act

UNIT STANDARD RANGE

Repairing small gas appliances, stoves, cookers, heaters and geysers. Repairs are done in accordance with manufacturer's manual.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:***SPECIFIC OUTCOME 1***

Plan to do fault finding and repair to small gas appliances.

OUTCOME NOTES***OUTCOME RANGE*****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Appropriate manuals and specifications for the appliance to be worked on are selected.

ASSESSMENT CRITERION NOTES***ASSESSMENT CRITERION RANGE*****ASSESSMENT CRITERION 2**

2. Manuals and specifications are interpreted according to specified task.

ASSESSMENT CRITERION NOTES***ASSESSMENT CRITERION RANGE*****ASSESSMENT CRITERION 3**

3. Component function is interpreted according to manufacturer's specifications.

ASSESSMENT CRITERION NOTES***ASSESSMENT CRITERION RANGE*****ASSESSMENT CRITERION 4**

4. Tools and test instruments to be used are selected according to specified task.

ASSESSMENT CRITERION NOTES***ASSESSMENT CRITERION RANGE******SPECIFIC OUTCOME 2***

Conduct fault finding and testing of small gas appliances.

OUTCOME NOTES***OUTCOME RANGE*****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Appliance are inspected for visible damages according to safety inspection sheets.

ASSESSMENT CRITERION NOTES***ASSESSMENT CRITERION RANGE***

ASSESSMENT CRITERION 2

2. Appliances are tested in correct sequence as per fault finding procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Faults are located and corrective action identified with the aid of manuals and specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Faults, wear and tear are identified according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Repair small gas appliances.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Appropriate tools are used to remove faulty components.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Components are selected and replaced according to manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Appliances are checked for correct assembly according to maintenance procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. Safety precautions are adhered to according to safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Conclude small gas appliance repair.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Each gas connection and seal is checked for leaks as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Repaired appliance is tested for correct operation according to manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Appliance is cleaned before approving it for service.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Tools and test instruments are cleaned and stored according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

> Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

> Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

> Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Knowledge that will help me understand and that I will be able to explain:

- > Types of appliances
- > Names, locations and functions of appropriate tools
- > Safety related to each tool
- > Care and storage of tools

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems (identification of defects and faults).

UNIT STANDARD CCFO WORKING

Work effectively with others (during testing of small gas appliances).

UNIT STANDARD CCFO ORGANIZING

Organize and manage oneself (fault finding and identification).

UNIT STANDARD CCFO COLLECTING

Collect, analyse, organise and critically evaluate information (during repairs).

UNIT STANDARD CCFO COMMUNICATING

Communicate (reporting of defects).

UNIT STANDARD CCFO SCIENCE

Use science and technology (environmental and personal safety).

UNIT STANDARD CCFO DEMONSTRATING

Understand the world as a set of related systems.

UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information

Specified Requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > Manufacturer's manuals
- > Manufacturer's safety procedures
- > OSH Act



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

13

Demonstrate an understanding of the uses and safety aspect associated with flammable energy sources

SAQA US ID		UNIT STANDARD TITLE		
113860		Demonstrate an understanding of the uses and safety aspect associated with flammable energy sources		
SGB NAME		ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction		Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION		
Physical Planning and Construction		Electrical Infrastructure Construction		
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC		Regular	Level 2	3
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER	

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission; Construction and Renewable Energy Sectors. A person credited with this unit standard will be able to:

Demonstrate an understanding of the uses and safety aspect associated with flammable energy sources such as gas etc. This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > An understanding of the different types of energy sources
- > OSH Act.

UNIT STANDARD RANGE

- > Flammable energy sources includes but is not limited to, gas and paraffin etc.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Store flammable energy sources in the correct manner.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Flammable energy sources are stored in a well-ventilated area and the reasons for it explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Flammable energy sources are not stored in a storage area, which is below surface level, and the reasons for this explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

4. No smoking signs are applied at storage area for flammable energy sources and the reasons for this explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

3. Flammable energy sources are not stored in direct sunlight or near a heat source and the reasons for this explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Handle and care of flammable energy sources and related equipment.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. A pressure regulator is always used with a gas bottle and the reasons for this explained according to safety standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The correct regulator is identified and selected per type of gas and the reasons for this explained according to safety standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Rubber hoses and clips are replaced every two years and the reasons for this explained according to safety standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. No smoking is allowed while working with flammable energy sources and appliances and the reasons for this explained according to safety standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Leaks are detected using either soapy water or approved electronic gas detectors according to safety standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Containers and gas bottles are clearly marked according to safety standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 3

Apply flammable energy sources safely.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Gas cylinders are kept in the upright position during use according to safety standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Hoses are kept clear of flames or hot surfaces according to safety standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Flammable energy sources are used in a ventilated area away from direct heat according to safety standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Correct method for lighting is used according to safety standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Valve or regulator tap is closed after use according to safety standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Gas cylinders are disconnected and sealed when not in use for prolonged periods according to safety standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 4

Maintain small appliances that use flammable energy sources.

OUTCOME NOTES**OUTCOME RANGE**

Appliances include but are not limited to small gas appliances, small paraffin appliances etc.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. Correct tools are used for the repair and maintenance and correctly used as per manufacturers specifications and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Personal protective equipment is used as per safety requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Small appliances that use flammable energy sources are maintained according to manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Safe work practise and good house keeping is maintained as per statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A broad understanding of flammable energy sources.
- > An understanding of the inherent dangers of flammable energy sources.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems (Identify potential unsafe practise and correct them.)

UNIT STANDARD CCFO WORKING**UNIT STANDARD CCFO ORGANIZING**

Organise and manage oneself (Develop safe and effective storage methods.)

UNIT STANDARD CCFO COLLECTING**UNIT STANDARD CCFO COMMUNICATING**

Communicate (Communicate safe practises to users and colleagues.)

UNIT STANDARD CCFO SCIENCE

Use science and technology (Understanding flammable energy sources and their dangers.)

UNIT STANDARD CCFO DEMONSTRATING

Understand the world as a set of related systems (Understand the impact of safe work ethics on others and their safety.)

UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information
Specified Requirements

- > Legal requirements
- > OSH Act.



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

14

Maintain servitudes, wayleaves and clearances

SAQA US ID	UNIT STANDARD TITLE		
113861	Maintain servitudes, wayleaves and clearances		
SGB NAME	ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction	Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 2	5
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the electrical Distribution network environment.

A person credited with this unit standard will be able to:

- > Maintain wayleaves and servitudes on Low / Medium / High Voltage networks.

This unit standard will contribute to the full development of the learner within the electrical distribution network environment. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within Geographical Information Sciences environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Application of Herbicides
- > Vegetation control machines & practices
- > Dangers of High Voltage systems

UNIT STANDARD RANGE

This unit standard applies to persons required to control vegetation and maintain access gates within servitudes & wayleaves on Low / Medium / High Voltage networks independently, or within a team.

Vegetation includes:

- > Grass
- > Weeds
- > Shrubs
- > Trees

Control methods include:

- > Mechanical (Handheld, chainsaws, weed eaters, brushcutters, high-cutters, etc.)
- > Chemical (Systemic, residual & contact types)

Environmental control include:

- > Indigenous vegetation
- > Protected vegetation

- > Alien vegetation
- > Wildlife protection

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan and prepare for maintenance of servitudes and wayleaves.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Preparation / planning of vegetation control within parameters of designated servitudes or wayleaves according to job instructions and customer requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Applicable tools / machinery are selected for various job combinations and checked if operational according to manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The associated personal protective equipment is selected and checked for functionality.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Ensure the relevant property owners are notified / informed and access negotiated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Ensure that the line to be worked on is isolated and earthed in terms of high voltage regulations where required.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 2

Maintain servitudes, wayleaves and clearances.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The appropriate tools and personal protective equipment selected according to the specific task requirement on site.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. A safety risk analyses to be carried out on critical line encroachment and report unsafe conditions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Clearing of vegetation done according to servitude / wayleave / clearance parameters / standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Vegetation to be cut, stored / stacked / removed as per negotiation with land owner.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Selective chemical treatment of specific vegetation according to herbicide manufacturer's specifications and applicable environmental legislation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Maintain access gates, roads and prevent soil erosion.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Access gates inspected for proper operation and maintained according to applicable standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Ensure that locking devices of access gates are in place and operational according to area specifications / customer requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Access roads inspected for ease of access.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Soil erosion backfilled and measures implemented to minimise re-occurrence.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Concluding the task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

2. All tools & equipment cleaned, stored and defects reported as per laid down specification.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

1. Ensure that access gates are left open / closed as per customer requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Chemicals / herbicides / applicators, related safety equipment and empty containers returned for disposal or storage according to environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. All applicable documentation completed accurately and submitted timeously.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A thorough understanding of the relevant procedures and practices.
- > A broad understanding of environmental awareness regarding the protection of indigenous and cultivated fauna and flora.
- > A comprehensive understanding of servitudes / wayleaves for electrical lines and routes.
- > A comprehensive understanding of risk assessment on electrical line clearances.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING****UNIT STANDARD CCFO COLLECTING**

Collect, evaluate, organise and critically evaluate information related to the maintenance of servitudes, wayleaves and clearances on electrical lines so that these are accurately interpreted into application performance standards.

UNIT STANDARD CCFO COMMUNICATING**UNIT STANDARD CCFO SCIENCE****UNIT STANDARD CCFO DEMONSTRATING**

UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information:

Specified Requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

Environmental Act

OHS Act



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

15

Handle and care of electrical earthing gear and related equipment

SAQA US ID		UNIT STANDARD TITLE	
113868		Handle and care of electrical earthing gear and related equipment	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL
PPC-EIC-0-SGB ECC		Regular	Level 2
			CREDITS
			2
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons who maintain fixed / portable earthing gear and related equipment. A person credited with this unit standard will be able to:

- > Handle, clean and store electrical earthing gear and related equipment.

This unit standard will contribute to the full development of the learner within the electrical distribution environment.

The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within Geographical Information Sciences environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > House keeping
- > Storage & stacking
- > Occupational health & safety.

UNIT STANDARD RANGE

This unit standard applies to persons handling, inspecting, cleaning and storing Low / Medium / High Voltage fixed and portable electrical earthing gear and related equipment independently. Earthing gear includes, but is not limited to:

- > Portable earthing gear (Low Voltage earthing gear, equipotential earthing gear)
- > Fixed earthing gear (attached to mobile equipment or structures of Medium / High / Extra High Voltage apparatus)
- > System earthing gear (metal clad / truck type switchgear, ring-main units) Related equipment include:
 - > Insulated operating rods (earthing stick, telescopic link stick, operating handle).

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Identify and handle electrical earthing gear.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Identify and determine the difference between Low / Medium / High Voltage portable earthing gear.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Identify and determine the difference between portable, fixed, control and working earths.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Electrical earthing gear handled carefully and correctly to avoid possible damage.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Portable earthing gear are carried / transported in approved carry bag.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Inspect and care of electrical earthing gear.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Electrical earthing gear visually inspected and mechanical defects reported.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Loose strands, secure connections, damaged insulation, malfunctioning clamps.

ASSESSMENT CRITERION 2

2. Numbering of electrical earthing gear checked if legible for record purposes.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Electrical earthing gear cleaned according to approved methods.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Electrical earthing gear stored according to approved methods.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Inspect and care of system earthing equipment.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. System earthing gear visually inspected and mechanical defects reported.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Loose strands, corroding / unravelling of copper braiding, secure connections, damaged insulation, malfunctioning clamps.

ASSESSMENT CRITERION 2

2. Labelling of system earthing gear checked if legible for record and identification purposes.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. System earthing gear cleaned according to approved methods.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. System earthing gear stored according to approved methods.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Inspect, handle and care of insulated operating rods.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Insulated operating rods visually inspected and mechanical defects reported.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Damaged / cracked tubes, malfunctioning clamps, metal fitting, securing clips / springs.

ASSESSMENT CRITERION 2

2. Numbering of insulated operating rods checked if legible for record purposes.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Insulated operating rods cleaned according to approved methods.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Insulated operating rods stored according to approved methods.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Insulated operating rod are carried / transported in approved carry bag.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A comprehensive understanding of the relevant procedures and practices.
- > A basic understanding of electrical induction and the purpose for earthing.
- > A basic understanding of different earthing systems and their application.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING****UNIT STANDARD CCFO COLLECTING**

Collect, evaluate, organise and critically evaluate information related to identifying, inspecting, handling, cleaning and storing of electrical earthing gear and related equipment so that these are accurately interpreted into application performance standards.

UNIT STANDARD CCFO COMMUNICATING**UNIT STANDARD CCFO SCIENCE****UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information
Specified Requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > OHS Act.
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

16

Identify, handle and assemble medium / high voltage line hardware and related materials

SAQA US ID	UNIT STANDARD TITLE		
113872	Identify, handle and assemble medium / high voltage line hardware and related materials		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 2	4
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons working in the Electrical Engineering and Distribution environment. A person credited with this unit standard will be able to:

- > Identify, handle and assemble Medium / High Voltage line hardware and related materials on site.

This unit standard will contribute to the full development of the learner within the Electrical Engineering and Distribution environment. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Electrical Infrastructure Construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Basic hand tools
- > Personal protective equipment
- > Housekeeping (including stacking & storing)
- > Basic rigging
- > Environmental awareness

UNIT STANDARD RANGE

This unit standard applies to persons working with, handling and assembling Medium / High Voltage line hardware and related equipment independently.

- > Hardware will include, but are not limited to wood pole structures, conductive elements, stays & struts, insulators, clamps, bolts and pre-formed products.
- > Equipment will include, but are not limited to Medium Voltage pole mounted isolators, breakers, sectionalisers, transformers, re-closers and surge arrestors.
- > Related material will include, but are not limited to cleaning materials / solvents, special lubricants, insulating oil.
- > Assembly will include dressing of poles / structures and cross-arms.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Identify and handle the appropriate medium / high voltage line hardware.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Instructions are interpreted and carried out as per job requirement.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Hardware identified as per instruction.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Personal protective equipment worn when handling hardware as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Hardware selected and handled as per work instruction / manufacturer's requirements, applying basic rigging principles if required.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Identify & handle the appropriate medium voltage equipment.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Instructions are interpreted and carried out as per job requirement.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. Equipment identified as per instruction.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Personal protective equipment worn when handling hardware as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Hardware selected and handled as per work instruction / manufacturer's requirements, applying basic rigging principles if required.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Assemble medium / high voltage line hardware.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Work site / area prepared according to worksite procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Personal protective equipment worn when assembling hardware as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Assemble hardware in logical sequence as per manufacturer's specifications and job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. Work site / area to be left in order as per environmental legislation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Identify and handle related materials used during medium / high voltage line hardware assembly.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Related materials identified as per job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Environmental requirements of applicable related materials are adhered to.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Personal protective equipment worn when handling related materials as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Related materials selected and handled as per manufacturer's specifications and job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Waste materials disposed of as per environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A basic understanding of assembling the relevant hardware.
- > A broad understanding of the application and purpose of hardware and related materials.
- > A basic understanding of the relevant procedures and practices relating to handling and assembling.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING****UNIT STANDARD CCFO COLLECTING**

Collect, evaluate, organise and critically evaluate information related to medium / high voltage line hardware and related materials so that these are accurately interpreted into application performance standards.

UNIT STANDARD CCFO COMMUNICATING**UNIT STANDARD CCFO SCIENCE****UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary information:

Specified requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

OHS Act

Environmental Act

ISO Standards



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

17

Inspect and clean medium / high voltage yards and enclosures

SAQA US ID		UNIT STANDARD TITLE	
113887		Inspect and clean medium / high voltage yards and enclosures	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL
PPC-EIC-0-SGB ECC		Regular	Level 2
			CREDITS
			2
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons working within the Distribution and Transmission environment to enable the inspections and cleaning of Medium / High / Extra High Voltage yards.

A person credited with this unit standard will be able to:

- > Inspect and clean Medium / High / Extra High Voltage yards and enclosures.

This unit standard will contribute to the full development of the learner within the electrical Distribution and Transmission environment.

The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within Geographical Information Sciences environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Statutory requirements for entry to MV / HV / EHV yards and enclosures (Operating Regulations for High Voltage Systems).
- > General Health & Safety (OHS Act)
- > Apply and maintain safety in an electrical environment
- > Recording / reporting skills
- > Environmental awareness

UNIT STANDARD RANGE

This unit standard applies to persons who will independently inspect and clean MV / HV / EHV yards and enclosures within the following range:

Inspections include, but are not limited to:

- > Prohibited area / live chamber fencing and access gates & locks
- > Anti-climbing devices
- > Crusher stone
- > Drainage
- > Earthing straps
- > Walkways / cable trench covers
- > Hazardous spills
- > Electrical cubicles / enclosures

- > Vegetation growth
- > Labelling / Safety signs
- > Fire fighting equipment
- > Yard lighting

Cleaning includes but is not limited to:

- > Hazardous spills
- > Weed / waste / rubble control
- > Cubicles
- > Drainage systems

Minor repairs (non-electrical) include, but are not limited to:

- > Fencing, access gates & locks
- > Cubicles
- > Yard crusher stone
- > Trenches & drainage

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan the task.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Job instructions are interpreted correctly and access permits and documentation arranged according to statutory requirements.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. Appropriate tools, and equipment are identified and selected according to job requirements.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. Select the correct inspection sheets necessary to complete the task.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 4

4. Select the correct personal protective equipment and safety rules / regulations are interpreted and applied.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Inspect Medium / High Voltage yards / enclosures and conduct minor repairs.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Ensure that necessary permits are received and workers' register completed.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Complete risk analyses to ensure safe working environment.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Inspection conducted and recorded according to prescribed inspection sheet.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Minor repairs are carried out according to job specifications as per inspection sheet findings.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Clean Medium / High Voltage yards / enclosures.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Cleaning of MV / HV yard is done according to the specified job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Tools and cleaning material are used in accordance with environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Safety-and-personal protective equipment is applied according to statutory requirements and safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Cleaning of hazardous substance spills / leaks are done in accordance with statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Conclude the task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Tools and cleaning materials are removed and stored according worksite procedure.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. All personnel are removed from the work site and access doors / gates are closed and locked according to the operating regulations for high voltage systems.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Rubble, weeds and hazardous waste materials are disposed of as per environmental procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Inspection sheets are completed and submitted according to maintenance procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A comprehensive understanding of the relevant regulations and procedures and practices regarding access & supervision.
- > A basic understanding of hazardous substances and environmental requirements.
- > An understanding of electrical safety awareness.
- > Effective communication / reporting skills.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING****UNIT STANDARD CCFO COLLECTING**

Collect, organise and critically evaluate information related to inspecting and cleaning Medium / High / Extra High Voltage yards / enclosures.

UNIT STANDARD CCFO COMMUNICATING**UNIT STANDARD CCFO SCIENCE****UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING**

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

Supplementary Information:

Specified Requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > Environmental Act relating to hazardous substances control.
 - > OHS Act relating to applicable operating regulations for high voltage systems.
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

18

Inspect service and maintain a photovoltaic supplied pump

SAQA US ID		UNIT STANDARD TITLE	
113864		Inspect service and maintain a photovoltaic supplied pump	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL
PPC-EIC-0-SGB ECC		Regular	Level 2
			CREDITS
			2
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector

A person accredited with this unit standard will be able to:

- > Plan to service and maintain a stand-alone photovoltaic supplied pump
- > Prepare service and maintain a stand-alone photovoltaic supplied pump
- > Service and maintain a stand-alone photovoltaic supplied system pump
- > Conclude the faultfinding and maintenance of a stand-alone photovoltaic supplied pump.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical infrastructure and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Electrical safety
- > Cleaning methods
- > Basic safety procedures related to tools
- > Use of portable electrical cleaning equipment
- > Communication and numeracy
- > Use of hand tools and test instruments
- > Installation of a stand alone photovoltaic supplied system or pump

UNIT STANDARD RANGE

- > Photovoltaic syplied systems as per NRS Code? In line with OHS Act standards
- > Manufacturer's specifications
- > DC pumps
- > Inverter supplied single phase AC pumps

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan to service and maintain a photovoltaic supplied pump.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Task instructions are obtained and understood (Interpreted).

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Job cards / works requests / maintenance schedules.

ASSESSMENT CRITERION 2

2. Identify the correct personal protective equipment as per your work place procedure.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Overalls; Aprons; Safety Glass; Face Shields; Masks.

ASSESSMENT CRITERION 3

3. Identify correct cleaning solvents and material as per your work place procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Waste; Rags; Chemical solvents; Brushes.

ASSESSMENT CRITERION 4

4. Identification of correct breakers for isolation of circuits for servicing and maintenance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Isolation and locked out.

SPECIFIC OUTCOME 2

Prepare to service and maintain a stand-alone photovoltaic supplied pump.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. The cleaning solvents and material are selected correctly as per job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Waste; Rags; Chemical solvents; Brushes.

ASSESSMENT CRITERION 2

2. The applicable portable electrical cleaning equipment is selected as per job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Blowers; Electrical Extension leads; Vacuum Cleaners.

ASSESSMENT CRITERION 3

3. The correct personal protective equipment is selected and worn according to safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Overalls; Aprons ; Safety Glasses; Face Shields ; Masks.

ASSESSMENT CRITERION 4

4. The batteries, inverter, voltage regulator and photovoltaic array are confirmed to be isolated and made safe as per lock out procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Verbal; written (permit system) permission to work.

ASSESSMENT CRITERION 5

5. The pump is removed from the bore hole for inspection and service as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

DC pumps or AC inverter supplied pumps.

SPECIFIC OUTCOME 3

Service and maintain photovoltaic supplied pump.

OUTCOME NOTES**OUTCOME RANGE**

DC pump or AC inverter supplied single phase pump.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. The photovoltaic supplied pump is visually inspected for defects as per maintenance procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Doors, battery enclosures, hinges, locking devices, structure damage, weather seal, rust, faded paint, moisture, dust, burnt insulation, name plates, labels.

ASSESSMENT CRITERION 2

2. The batteries, photovoltaic array, voltage regulator, inverter, and pump are cleaned with the approved cleaning materials and solvents as per job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The cleaning materials and equipment are used correctly as per safety standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Appropriate use of personal protective equipment is demonstrated during the cleaning process as per safe work procedures are demonstrated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. The damaged components are repaired and replaced according to maintenance procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Loose hinges, locking / latching devices, damaged panels etc.

ASSESSMENT CRITERION 6

6. The consequences of using incorrect cleaning methods, solvents and materials are explained in relation with hazardous substance control standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. The pump is serviced, maintained and re-installed as per manufacturer's manuals and work instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

DC pump or AC inverter supplied single phase pump.

SPECIFIC OUTCOME 4

Conclude the maintenance of a photovoltaic supplied pump.

OUTCOME NOTES**OUTCOME RANGE**

General house keeping; records; reports and re-energising.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. All defects and suspected faults are recorded and reported in line with specific work site requirements

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

History files; job cards; maintenance reports.

ASSESSMENT CRITERION 2

2. The used cleaning solvents and rags are correctly disposed of as per safety and environmental standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Flammable material drums; waste drums; incinerators.

ASSESSMENT CRITERION 3

3. The cleaning solvents are properly sealed and correctly stored to prevent hazardous fumes; substance spillage and risk of fire as per relevant safety standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Flame proof storage; ventilated rooms.

ASSESSMENT CRITERION 4

4. All cleaning equipment is returned and stored as per house keeping standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. All defective components are correctly disposed of in accordance to work site procedures and environmental standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

1. A good understanding of isolation and lockout procedures.
2. A thorough understanding of the related work site standards and procedures.
3. A basic understanding of cleaning material and solvents.
4. A comprehensive understanding of the effects of certain cleaning solvents when applied to various parts / materials of distribution boards or panels.
5. A good understanding of the handling of chemicals and solvents.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING**

Organise oneself and one's activities responsibly and effectively in the ability to follow instructions when working under supervision to ensure the safe execution of work activities.

UNIT STANDARD CCFO COLLECTING

Collect, evaluate, organise and critically evaluate information related to isolation / lockout procedures of electrical equipment, thus ensuring safe execution of work.

UNIT STANDARD CCFO COMMUNICATING

Effective use of communication methods when recording and reporting information.

UNIT STANDARD CCFO SCIENCE

Use science and technology effectively and critically, showing responsibility towards the environmental and the health of others by complying to the Environmental Management and Safety standards when using chemical solvents and hazardous substances.

UNIT STANDARD CCFO DEMONSTRATING**UNIT STANDARD CCFO CONTRIBUTING**

Tasks using responsible thinking and decision making in relation to the use and choice of relevant personal protective equipment.

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

Supplementary Information:
Specified Requirements

Legal Requirements:

NRS Code
SABS 0142
Relevant sections of the OHS Act
Relevant environmental management processes / procedures

A glossary of terms about the terminology of:

Context Specific

- > Manufacturer's specifications in relation to cleaning solvents
- > Lockout system
- > Work site / safe work policies and procedures



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

19

Install and commission photovoltaic supplied pump

SAQA US ID	UNIT STANDARD TITLE		
113871	Install and commission photovoltaic supplied pump		
SGB NAME	ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction	Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 2	3
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector

A person credited with this unit standard will be capable of:

Install and commission photovoltaic supplied water pump.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical infrastructure and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > An understanding of how the components in a photovoltaic supplied system functions
- > An understanding of how DC motors operate
- > An understanding of how single phase AC motors operate
- > Unit standard on the Installation of a photovoltaic supplied system
- > Statutory requirements
- > Use of relevant testing and measuring equipment and hand tools

UNIT STANDARD RANGE

- > A photovoltaic supplied pump includes but is not limited to:

DC pump

AC inverter supplied pump

- > Testing and measuring equipment include but is not limited to:

Multimeters,

Insulation tester,

Clip-on ammeter

- > Statutory Requirements include but are not limited to:

OHS Act,

SABS Regulations,
NRS Code of Practise
Local Authority requirements,
Manufacturer's specifications

> Work site procedures

> Electronic devices may include but are not limited to - Voltage regulators, inverters, compensators etc.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan to install and commission water pump.

OUTCOME NOTES

OUTCOME RANGE

DC pump, single-phase inverter supplied pump.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. The tasks are interpreted and a sequence of operation is determined according to the job instruction.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. Applicable electrical drawings are correctly interpreted and selected to meet job requirements.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. Equipment and personal protective equipment is selected, inspected and checked for functionality and safety prior to commencement.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 4

4. Safety- and work site procedures are obtained as per job requirements.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 5

5. The water pump, its associated electronic control devices, photovoltaic array and mounting bracket are identified and selected according to job instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Permission is obtained to carry out task according to instructions and drawings.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. Appropriate tools are identified and selected to meet the requirements of the task.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Prepare to install, connect and commission a photovoltaic supplied water pump.

OUTCOME NOTES**OUTCOME RANGE**

DC pump, single-phase inverter supplied pump.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. The work area is demarcated according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The water pump, its associated electronic control devices, photovoltaic array and mounting bracket are checked in accordance with manufacturer's specifications and functional requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Work site is inspected for safety and hazards and corrective action is taken according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. Installation area is prepared for the placing, mounting and securing of the pump, photovoltaic array and mounting bracket as per job instructions, drawings and diagrams.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Install a photovoltaic supplied water pump.

OUTCOME NOTES**OUTCOME RANGE**

DC pump, single-phase inverter supplied pump.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. Appropriate tools are selected and used correctly as per manufacturer's specifications and work site standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. All machines and associated control gear is tested for functionality to meet desired operational requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The water pump, its associated electronic control devices, photovoltaic array and mounting bracket are installed according to instructions, drawings, diagrams, manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Explain the consequences of not using the tools according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 4

Connect a photovoltaic supplied water pump.

OUTCOME NOTES**OUTCOME RANGE**

DC pump, single-phase inverter supplied pump.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. Appropriate tools are used to meet the requirements of the task according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. All personal protective equipment is used as per safety requirements and work site requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The appropriate control gear is connected to the AC machines as per manufacturer's specifications and operational requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The AC machines and associated control gear are connected to supply and load according to manufacturers specifications and operational requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 5**

Commission a photovoltaic supplied water pump.

OUTCOME NOTES**OUTCOME RANGE**

DC pump, single-phase inverter supplied pump.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. Appropriate test and measuring equipment are selected to meet the job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. Measuring and testing equipment are used correctly and safely.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Tests are carried out according to work site procedures and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Faults are traced and rectified where applicable according to faultfinding procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Commissioning is carried out and operational tests conducted to determine if the AC machine and control gear is functioning according to installation and manufacturer's requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 6**

Complete installation, connection and commissioning of a photovoltaic supplied water pump.

OUTCOME NOTES**OUTCOME RANGE**

DC pump, single-phase inverter supplied pump.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. The work area is restored to a serviceable condition according to housekeeping and environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Appropriate tools are cared for and stored according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Damaged or faulty tools are identified, marked for repair or replacement or reported according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Tests are recorded and reported as per data management systems and reporting procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Basic safety procedures related to testing and measuring equipment and hand tools.
- > Work site procedures
- > Installation, connection, commissioning, testing and measuring techniques.
- > Names, locations and functions of appropriate tools.
- > Care, storage and safety related to each tool.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems in installing, connecting testing and commissioning a photovoltaic supplied water pump.

UNIT STANDARD CCFO WORKING

Work effectively with others involved during installation, connecting and commissioning a photovoltaic supplied water pump.

UNIT STANDARD CCFO ORGANIZING

Organise and manage one self in planning the work and sequence of tasks.

UNIT STANDARD CCFO COLLECTING

Collect, analyse, organise and critically evaluate information obtained during installation, connecting and commissioning a photovoltaic supplied water pump.

UNIT STANDARD CCFO COMMUNICATING

Communicate with all involved, the interpretation and reporting processes.

UNIT STANDARD CCFO SCIENCE

UNIT STANDARD CCFO DEMONSTRATING**UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information:

Specified Requirements

- > SABS
 - > OHS Act
 - > NRS
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

20

Install Medium Voltage transformers

SAQA US ID		UNIT STANDARD TITLE	
113886		Install Medium Voltage transformers	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 2	6
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Distribution; Transmission and Construction Sector.

The person credited with this unit standard is capable of: Installing Medium Voltage transformers, according to statutory requirements to distribute and control electricity to electrical apparatus.

This unit standard will contribute to the full development of the learner within the electrical distribution, transmission and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical distribution, transmission and construction environment.

LEARNING ASSUMED TO BE IN PLACE

- > Select, use and care for basic hand tools.
- > Introduction to industry.
- > Lay out drawings.
- > Power tools (portable).
- > Material and equipment handling procedures.
- > Basic safety procedures related to the type of work and location.
- > Climbing, lifting equipment and basic rigging.

UNIT STANDARD RANGE

- > Preparation includes the removal of existing transformer.
- > Connections are limited to step up and down, current transformer, voltage transformer, single phase and 3 phase.
- > Worksite procedures include but are not limited to written or verbal procedures, formal and informal methods.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan to install Medium Voltage transformers.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Tasks are interpreted and sequence of operation is determined according to job instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Layout Sketch or Drawings; Work Sheets or Job Cards.

ASSESSMENT CRITERION 2

2. Personal protective clothing and equipment needed for installation of cables and Medium Voltage transformers is identified and arranged for use according to safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Hard Hat; Safety harness; Gloves; safety glasses; ladders, safety shoes.

ASSESSMENT CRITERION 3

3. Appropriate drawings and documentation are acquired as per job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Key coding and site layout.

ASSESSMENT CRITERION 4

4. Tools and materials required for installing Medium Voltage transformers was identified and available for use according to job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

- > Hand Tools: - Hacksaw; Cobblers Knife; Pliers; Side Cutters; Water Pump Pliers; Shifting Spanner; Crimping tool; Sockets; Allan Keys; Hammer; Screwdrivers.
- > Specialised Tool: - cable cutter; Auger; Bandit Strap Machine.

ASSESSMENT CRITERION 5

5. Affected parties are liased with and informed according to worksite procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 6

6. All mechanical aids for handling / lifting transformers are identified and arranged as per job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Forklifts and hoists.

ASSESSMENT CRITERION 7

7. Methods used to select the appropriate transformer are in line with site specifications and requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Prepare to install Medium Voltage transformers.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Point of installation is identified in accordance with work instructions, drawings / plans.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Work area and transformer are inspected and prepared for installation according to work site requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Authorisation is obtained according to worksite procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Working area is secured according to safety risk assessment requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Barricades, tapes and warning signs.

ASSESSMENT CRITERION 5

5. Purpose of inspection and preparation of working area for installation is explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Obstacles and safety hazards are identified and necessary precautions are taken according to safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Install Medium Voltage transformers.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The transformer is positioned according to instructions and / or drawings.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The transformer is secured according to work instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Cables / conductors are connected according to drawings and work instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Earthing, bonding; primary conductors, secondary conductors and cables.

ASSESSMENT CRITERION 4

4. Tools and equipment are used safely to meet the requirements of the job.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 5

5. Personal protective equipment is used and site specific procedures are adhered to throughout the installing process according to safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete the installation of Medium Voltage transformers.

OUTCOME NOTES**OUTCOME RANGE**

Clean up; pack away; record; report; dispose of; remove.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. Termination and connections are tightened according to manufacturer's specifications and all covers and guards are secured work place requirements and standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The terrain is reconstituted and reinstated in accordance with work site procedures, environmental- and customer requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Work area is cleaned after completion of task in accordance with work site procedures and housekeeping standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Waste materials are disposed of in accordance with safety standards and environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 5

5. Necessary documentation is completed and submitted as per local data management systems.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

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- > Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
- > Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A basic understanding and skills in the utilisation of hand tools / lifting techniques and measuring tools and specialised tools.
- > A basic understanding and knowledge of: Legislation and applicable regulations.
- > A basic knowledge of: safety related standards and procedures.
- > A basic knowledge of: Environmental awareness.
- > Able to read and interpret basic drawings; diagrams and instructions.
- > Terminology associated with transformers/components.
- > Working principles associated with transformers/components.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING**

Organise oneself and one's activities responsibly and effectively (in the ability to follow instructions when working by ones self or in a work team, ensure safe execution of work activities).

UNIT STANDARD CCFO COLLECTING

Collect, evaluate, organise and critically evaluate information related to (installing of Medium Voltage transformers).

UNIT STANDARD CCFO COMMUNICATING

Effective use of communication methods when (giving instructions to fellow workers, recording and reporting information).

UNIT STANDARD CCFO SCIENCE

Use science and technology effectively and critically, showing responsibility towards the environmental and the health of others (installing of Medium Voltage transformers to ensuring that all safety and environmental conditions are considered).

UNIT STANDARD CCFO DEMONSTRATING

Tasks using responsible thinking and decision making (in relation to the use and choice of relevant personal protecting equipment and safety equipment).

UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information:

Specified Requirements

Legal Requirements:

- > SABS 0142
- > OHS Act
- > Local Authority

Context Specific

Specific to a discipline or a industry

- > Medium Voltage will be less than or equal to 1000 volts
 - > Manufacturers specifications
 - > Work site policies and procedures
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

21

Operate on low voltage networks

SAQA US ID		UNIT STANDARD TITLE	
113865		Operate on low voltage networks	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL
PPC-EIC-0-SGB ECC		Regular	Level 3
			CREDITS
			12
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Low Voltage reticulation environment

The person credited with this unit standard is capable of carrying out operating on Low Voltage networks by doing:

- > Switching of apparatus
- > Linking of apparatus
- > Safety testing and earthing of apparatus
- > Prepare apparatus for safe / working conditions [where applicable]
- > Returning apparatus to service

This unit standard will contribute to the full development of the learner within the electrical reticulation environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Electrical Infrastructure and Construction environment.

LEARNING ASSUMED TO BE IN PLACE

- > Apply safety in the electrical environment
- > Introduction to industry
- > Low voltage regulations (extensions of the OHS Act)
- > Read and interpret low voltage network diagrams
- > Low voltage test instruments
- > Handling and caring of electrical earthing gear and related equipment
- > Names and functions of low voltage apparatus found on electrical reticulation networks

UNIT STANDARD RANGE

- > Operating is limited to Low Voltage networks to include switching, linking, safety testing, earthing, and preparation for work.
- > Operating conditions include normal / abnormal, planned / unplanned and day / night.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan and prepare to operate on low voltage networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Determine the scope of work to be carried as per work request.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The affected customers are notified of the outage times as per job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Plan the sequence of events in conjunction with the Work Co-ordinator and work teams where applicable.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Ensure that the relevant earthing gear, insulated operating sticks, applicable testing devices and keys are available and serviceable.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Visible inspection is carried out on the apparatus to be operated on to ensure that it is in a good serviceable condition as per the manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 2

Switch apparatus on low voltage networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The appropriate Low Voltage circuit breakers are identified, checked for irregularities, correct labelling and that safety signs are attached as per the statutory requirements or operating standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Ensure that the appropriate lock out devices are in place and applied as per operating or lock out procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The applicable safety gear and personal protective equipment is selected and used in accordance with safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The appropriate breakers or switches are identified, operated and locked out as per operating or lock out procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Isolate apparatus on low voltage networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. The appropriate isolators, fuses or neutral links are identified and checked for irregularities and correct safety labels and signs attached as per operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The applicable safety gear and personal protective equipment is selected and used in accordance with safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The appropriate isolators are opened or closed and status verified according to operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The appropriate fuses or neutral link inserts removed where applicable according to operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. All cubical doors are secured and locked on completion of isolation according to operating procedures

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Safety test and earth apparatus on low voltage networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The safety test device is selected, inspected and checked for functionality prior to earthing being carried out as per operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. The isolated Low Voltage network is safety tested as per operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The applicable safety gear / personal protective equipment is selected and used in accordance with safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Earth gear are correctly selected and inspected to be in good condition as per operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. The earthing gear is adequately applied to the apparatus / circuit as per the operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 5**

Restore supply to low voltage networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. All equipment has been removed from the work site and all workers have been informed that the apparatus will be returned to service according to operating regulations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. All earthing gear is removed from the apparatus or circuit according to operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. The appropriate isolators are opened or closed and fuses or neutral links replaced where applicable and status verified as per operating procedure.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Lockout devices are removed according to lockout procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. The appropriate breakers or switches are identified, operated, status verified and reported where necessary as per operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Safety labels and warning signs are removed and cubical doors locked according to operating regulations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A comprehensive understanding of operating principles and terminology.
- > Able to read, report and interpret work instructions and operating procedure.
- > Able to use a range of operating equipment and testers.
- > Ability to read and relate to operating diagrams.
- > A basic understanding of related safety standards and procedures.
- > A comprehensive understanding of how to physically operate the different types of apparatus.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

UNIT STANDARD CCFO WORKING**UNIT STANDARD CCFO ORGANIZING**

Organise oneself and one's activities responsibly and effectively, with the ability to follow work instructions or procedures when working independently or in a work team to ensure safe execution of work activities.

UNIT STANDARD CCFO COLLECTING

Collect, evaluate, organise and critically evaluate information related to operating of apparatus on low voltage networks.

UNIT STANDARD CCFO COMMUNICATING

Effective use of communication methods when giving or receiving instructions and notifying customers.

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING**

Responsible thinking and decision making with regard to safety precautions and procedures during operating process to be applied at all times.

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

Supplementary information:

- > This unit standard can be assessed in a workplace environment, or in a training or educational environment if simulated equipment response and examples are able to be provided, or in a combination of both environment
- > Performance in relation to the elements must comply with current legislation, especially the OSH Act and their subsequent amendments, electricity supply industry codes of practice and documented procedures. A full list of current legislation and industry codes is available from the SETA
- > Reference to terms, procedures, and specifications in this unit standard may be taken as including documented procedures and specifications relevant to the workplace in which assessment is carried out.
- > Performance in relation to the elements must comply with Industry operating regulations for high voltage systems [ORHVS] being extensions of the OHS Act. Also industry operating standards.
- > All work practices shall meet documented industry maintenance standards, including the quality management requirements, and the documentation of activities, events, and decisions.

Specified requirements

Legal requirements:

OHS Act

Low Voltage regulations

Local or Industry Authority regulations



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

22

Inspect, test, maintain and repair Low / Medium voltage networks

SAQA US ID	UNIT STANDARD TITLE		
113866	Inspect, test, maintain and repair Low / Medium voltage networks		
SGB NAME	ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction	Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 3	8
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the electrical low / medium voltage reticulation environment.

A person credited with this unit standard will be able to do the following on low / medium voltage reticulation networks:

- > Visual / routine inspection and report defects.
- > Carry out routine maintenance.
- > Carry out repairs during normal and faulty conditions.
- > Carry out faultfinding / tests during faulty conditions.
- > Demonstrate knowledge of low / medium voltage network maintenance procedures.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical construction- and distribution environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Apply and adhere to electrical safety.
- > Read & interpret station electric / network diagrams.
- > Jointing and faultfinding on low voltage cables.
- > Select, use and care for electrical measuring instruments.
- > Use and care for hand tools.

UNIT STANDARD RANGE

- > Overhead lines include but are not limited to steel/ wood/ concrete poles, stays, bare conductors, covered conductors, aerial bundle conductors, and insulators.
- > Equipment will include, but are not limited to Low / Medium Voltage pole mounted isolators, breakers, sectionalisers, transformers, reclosers, surge arrestors.
- > Hardware will include, but are not limited to Low / Medium Voltage wood / steel / concrete pole structures, cables, conductors, stays & struts, insulators, clamps, bolts and pre-formed products.
- > Maintaining & repairing include but are not limited to repairing / replacing of hardware and equipment.
- > Conditions include but are not limited to routine maintenance and breakdown repairs during day / night times

and all weather conditions.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan and prepare to inspect, test and maintain / repair Low / Medium Voltage networks.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Job instructions are obtained and the section of electrical network to be inspected / maintained / repaired is identified according to geographical / electrical network diagrams.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. Task instructions are interpreted and a sequence of operation is planned according to maintenance procedures.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. Isolation of the affected section of the network is arranged according to job instructions / maintenance schedules or breakdown reports where necessary.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 4

4. Appropriate tools are identified and selected to meet the requirements of the task and according to job requirements.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 5

5. Tools, materials, transport / rigging and safety equipment required for installing the unit are selected and checked for functionality according to statutory requirements.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

SPECIFIC OUTCOME 2

Inspect and test for defects on Low / Medium Voltage networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Conditions are assessed and safety measures implemented according to safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The affected section of the electrical reticulation network is visually inspected from ground level prior to testing / maintenance / repairs according to prescribed routine inspection sheets or fault finding procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Ensure that the affected section of the electrical reticulation network is isolated and prepared for testing according to faultfinding / operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The applicable test instruments are selected and testing carried out according to specific task requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Safety precautions / procedures are followed before, during and after inspection and testing installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 3

Maintain / repair Low / Medium Voltage networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Handout of the affected section of the network is received according to job instructions or breakdown reports where necessary.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The affected electrical hardware and equipment is assessed for possible safety risks and preventative measures implemented according to safety risk assessment procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The electrical hardware and equipment is maintained, repaired or replaced according to applicable maintenance procedures or manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The maintained or replaced electrical hardware and equipment is inspected and tested to ensure that it is operational according to manufacturer's requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete the work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Work area is restored to serviceable condition according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Completion of job is communicated according to local reporting procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Ensure that the replaced hardware and equipment has been returned to the stores as per local asset management procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Appropriate tools and safety equipment are cared for and stored according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Documentation is completed according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

> Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

> Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

> Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Knowledge that will help me understand and that I will be able to explain:

- > A comprehensive understanding of Low / Medium Voltage reticulation network hardware and equipment.
- > A good understanding of faultfinding procedure on Low / Medium Voltage networks.
- > Use tools safely, according to statutory requirements.
- > Apply basic safety procedures related to the type of work and location.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identifying and solving problems in which responsible decisions have been made regarding the maintenance / replacement of electrical line hardware / equipment.

UNIT STANDARD CCFO WORKING

Working effectively with others as a member of the electrical maintenance team.

UNIT STANDARD CCFO ORGANIZING

Organising and managing oneself and one's activities, responsibly and effectively.

UNIT STANDARD CCFO COLLECTING

Collecting, analysing, organising and critically evaluating information.

UNIT STANDARD CCFO COMMUNICATING

Communicating effectively, using visual and / or language skills by means of oral / written reports.

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

N/A



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

23

Fault find a photovoltaic supplied system

SAQA US ID	UNIT STANDARD TITLE		
113869	Fault find a photovoltaic supplied system		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 3	8
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the electrical engineering and industrial environment.

A person credited with this unit standard will be capable of:

Finding, repairing faults and maintaining industrial electrical circuits according to applicable drawings and statutory requirements to ensure continuous operation.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Electrical safety
- > Electrical drawings
- > Hand tools
- > Application of electrical testing instruments
- > Install wire and commission a stand-alone photovoltaic supplied system
- > Power tools

UNIT STANDARD RANGE

1. Statutory requirements includes but are not limited to:

- > OSH Act, SABS 0142, NRS 052
- > Authority requirements
- > Manufacturers specification and worksite procedure.

2. Electrical drawing include but is not limited to:

- > Schematic diagrams
- > Wiring diagrams
- > Connection/terminal connections
- > Cable schedules

- > Layout drawings and floor/building plans
- 3. System includes single and DC circuits
- 4. Circuits power / main and control
- 5. Fault finding and maintenance covers AC and DC
- 6. Electrical components include but are not limited to:
 - > Panels, contactors, relays, timers, push buttons, selector switches, indication lights, protective devices (fuses, circuit breakers, surge arrestors, overload devices, earth leakage units, etc.), connection terminals, wiring, fixed electrical measuring instruments and auxiliary equipment (voltmeter, ammeter, etc), thermostats, solenoid valves, liquid level controllers.
- 7. Electrical testing instruments include but are not limited to:
 - > Multimeter
 - > Insulation tester
 - > Earth leakage tester
 - > Impedance tester
 - > Polarity tester
- 8. Tools include but are not limited to:
 - > Gripping
 - > Cutting
 - > Turning
 - > Striking
 - > Power tools
- 9. Safety and good house keeping practices are adhered to before, during and after performance.
- 10. Worksite/work area, etc.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan to maintain a stand-alone photovoltaic supplied system.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

- 1. Planning is done according to prescribed outage schedules.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. Planning is integrated with other disciplines and associated equipment.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Planning is arranged according to equipment operating history reports and failure rate.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Planning is aligned with maintenance schedules.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Planning is arranged according to customer requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Prepare to maintain a stand-alone photovoltaic supplied system.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Correct / applicable electrical layout and wiring diagrams are obtained as per job instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Isolation points of industrial electrical circuits identified as per circuit diagrams.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Isolation undertaken safely and according to worksite / stand-alone photovoltaic supplied system procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Safe isolation of electrical circuits verified against job instructions and safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Safety and / or security lockout systems applied according to worksite procedures and safety practices.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Reasons for having isolation points in certain areas explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. The importance of verification when isolating circuits explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 8**

8. Location and purpose of installing warning signs to be explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Find and repair faults on a stand-alone photovoltaic supplied system.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Sequence of operation is determined as per job instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Applicable safety equipment is selected and used according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Applicable testing instruments and tools are selected according to job and applicable statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Electrical plant operation is observed to identify possible causes of faults in accordance with manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Applicable circuit drawings are interpreted according to possible causes of faults identified in relation to applicable circuit drawings to determine corrective action.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Faultfinding is done by making use of a logical method according to fault finding techniques.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. Fault finding results are recorded and reported according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 8

8. Faults that endanger life corrected immediately.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 9**

9. Applicable tools, equipment, materials and components to rectify faults are selected according to job requirements and work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 10**

10. Faults are safely repaired according to work site procedures and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Maintain a stand-alone photovoltaic supplied system.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Applicable safety equipment is selected and used according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Applicable testing instruments, tools, drawings, equipment, material and components are selected according to job and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Electrical circuits are correctly identified and selected according to schedule/instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. Electrical circuits are safely maintained according to statutory requirements to prevent breakdowns and loss of operation/service.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 5**

Complete the work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Work area is cleared and cleaned on completion of task according to housekeeping requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Waste materials disposed of according to site specific standards, procedures and environmental policies.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Industrial electrical circuits re-commissioned on completion of task as per operational standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Quality checks conducted and corrective action taken where required as per quality standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Panel / enclosure doors, covers properly secured or locked to restrict unauthorised access as per safety standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 6

6. Lockout devices and warning signs removed.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. Job cards / work orders and check sheets correctly completed and maintenance reports submitted.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A comprehensive understanding of the relevant legislation, authority requirements, procedures and practices
- > A broad understanding of a stand-alone photovoltaic supplied system.
- > A comprehensive understanding of electrical faultfinding procedures.
- > A basic understanding of electrical protection systems.

Knowledge that will help me understand and that I will be able to explain:

- > Fault finding methods and procedures
- > Applicable worksite procedures
- > Electrical isolating procedures

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems (Identify faults)

UNIT STANDARD CCFO WORKING**UNIT STANDARD CCFO ORGANIZING**

Organise and manage oneself (Selection of applicable tools, equipment drawing material and components. Planning and organising)

UNIT STANDARD CCFO COLLECTING

Collect, analyse, organise and critically evaluate information (Analyse faults)

UNIT STANDARD CCFO COMMUNICATING

Communicate (Writing of reports)

UNIT STANDARD CCFO SCIENCE

Use science and technology (Using measuring instruments and discriminate)

UNIT STANDARD CCFO DEMONSTRATING**UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information:

Specified Requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > OHS Act
 - > Manufacturer's plant specifications
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

24

Inspect, operate and maintain high mast lighting structures

SAQA US ID	UNIT STANDARD TITLE		
113875	Inspect, operate and maintain high mast lighting structures		
SGB NAME	ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction	Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 3	7
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering, Generation, Distribution, Transmission, Construction and Renewable energy sectors. Cognizance must be taken for the physical abilities required to carry out this task.

A person credited with this unit standard will be able to:

Identify, inspect, use and maintain high mast lighting structures and luminaires attached to the se structures according the statutory requirements.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical planning and construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills, attitude and or equivalent:

- > Safe handling of hand tools.
- > Safe handling of electrical power tools
- > General electrical safety
- > Safety at road works
- > Identify, inspect maintain and care for luminaries
- > Work site procedures and standard pertaining to this task.
- > Use and maintain measuring instruments
- > Two way radio communication

UNIT STANDARD RANGE

High mast structures include all such high mast structures, which incorporate means to access the lighting clusters by lowering the cluster. These include:

- a. Bow-mast type
- b. Ring type
- c. Scissors type
- d. Telescopic type

Tools and equipment pertaining to the raising and/or lowering of high mast structures, include but are not limited to:

- a. Winches
- b. Winch handles
- c. Gearboxes
- d. Powered, shaft driven equipment
- e. Ropes
- f. Steel wire.
- g. Jacks
- h. Hydraulic rams
- i. Hydraulic jacks
- j. Specialized high mast structure tools
- k. Maintenance cages
- l. Extension cables

Material pertaining to the raising and/or lowering of high mast structures, includes but is not limited to:

- a. Hoisting cables
- b. Trailing cables
- c. Ny-lock bolts and nuts

Statutory requirements include but are not limited to:

- a. OHS act
- b. Road and traffic ordinance
- c. Local Authority Requirements

Specific range statements are provided in the body of the unit standards where they apply to specific outcomes or assessment criteria.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Identify components of high mast structure and related tools and equipment.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Various types of high masts are identified.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. Various types of locking, lowering and raising mechanisms are identified and explained.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. Various types of specific tools, equipment and parts thereof, are identified and explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Various types of counter balance weights are identified.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Plan to raise and lower a high mast illumination cluster.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Job instructions are obtained from supervisor or works co-ordinator.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Verbal instructions, Job cards and/or work requests.

ASSESSMENT CRITERION 2

2. Personal protective equipment is identified according to work place standards and procedures and the OHS act.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Overalls, hard hat, gloves, safety shoes, Harnesses, safety glasses or shields.

ASSESSMENT CRITERION 3

3. Plan work, select the correct tools, equipment and material.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Equipment, tools and high mast structures inspected and the resultant action taken in accordance to work site procedure and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 5

5. Inspection of the work area and the resultant action taken in accordance to the work site procedures and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Prepare to lower and raise the high mast-illuminating cluster.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Interpret job instructions as per requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Verbal instructions, Job cards or work requests.

ASSESSMENT CRITERION 2

2. Appropriate Safety equipment is selected for the job, as per work place safety requirements and the OHS act.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Overalls, hardhat, gloves, safety shoes, Harnesses, safety glasses or shields, mechanical interlocking systems, mechanical fastening systems.

ASSESSMENT CRITERION 3

3. Work area is inspected, prepared and made safe as per work standard and procedure, manufacturer's requirements and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Work site area barricaded in accordance with work standard procedure and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Road signs, road cones, danger tape and flag man.

SPECIFIC OUTCOME 4

Lower and/or raise of the high mast-illuminating cluster.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Instructions are interpreted in accordance to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Raising and lowering of high mast lighting structure carried out in accordance to manufacturers specifications, work site procedure and OHS act.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Correct and safe utilisation of assistants for the duration of the procedure in accordance to manufacturers specifications and work site procedure.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Correct mounting, use and dismantling of equipment used for the purposes of lowering and raising the high mast structure.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 5**

Complete the work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. The work is rechecked to ensure that the high mast structure is correctly secured in its resting position as in accordance with work safe procedures, statutory requirements and manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Work area is cleaned in accordance with house keeping standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Ensure that tools and equipment are stored in their correct places in accordance with work procedure and statutory requirements and manufacturers specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Waste materials are disposed of according to work safe procedures and statutory requirements and environmental standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Documentation is completed in detail and submitted to meet work site standards and procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Written data, records, test or inspection reports.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of the assessment will be overseen by the relevant ETQA according to the relevant moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Knowledge that will help me to understand and that I will be able to explain:

- > A comprehensive understanding of the relevant work site procedures and practices.
- > A broad understanding of types of specialized tools used for lowering and raising the high mast structure illumination clusters.
- > A comprehensive understanding of the types of high mast structures.
- > Name and functions of the high mast structures.
- > Name and functions of the high mast structure equipment used for raising and lowering the illumination cluster.
- > Safety aspects that need to be taken into consideration.

> Applicable statutory requirements

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty tools and equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others when lowering or lifting the luminair cluster.

UNIT STANDARD CCFO ORGANIZING

Organize oneself and one's activities responsibly and effectively in the ability to follow instructions when working by one's self or in a work team, ensure safe execution of work duties.

UNIT STANDARD CCFO COLLECTING

Collect, evaluate, organize and critically evaluate information related to lowering and/or raising high mast illumination clusters.

UNIT STANDARD CCFO COMMUNICATING

Effective use of communication methods when giving instructions to fellow workers, recording and reporting information.

UNIT STANDARD CCFO SCIENCE

Use science and technology effectively and critically, showing responsibility towards the environment and the health of others.

UNIT STANDARD CCFO DEMONSTRATING

Demonstrate the understanding of the world as a set of related systems by recognizing that problem solving do not exist in isolation.

UNIT STANDARD CCFO CONTRIBUTING

Tasks using responsible thinking and decision making (in relation to the use of tools and equipment, choice of using relevant personal protective equipment and safety equipment).

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

Supplementary information

Specified requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > OHS act
- > Road and traffic ordinance
- > Environmental legislation
- > Work site procedures



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

25

Perform work on energised low voltage networks

SAQA US ID		UNIT STANDARD TITLE	
113889		Perform work on energised low voltage networks	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL
PPC-EIC-0-SGB ECC		Regular	Level 3
			CREDITS
			8
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the electrical low voltage reticulation industry

The person credited with this unit standard is capable of:

Doing maintenance on energised low voltage reticulation lines in accordance with industry requirements, work procedures, standards and statutory requirements.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard is essential for social and economic transformation and up-liftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

Safety procedures (electrical)
 Applied electrical theory
 Induction to industries
 Electrical drawings
 Applicable electrical test instruments
 Basic safety procedures related to tools, electricity and cleaning solvents
 Names and functions of low voltage equipment and associated components
 Relevant ORHVS modules where applicable
 First aid level two
 Basic rigging
 Low voltage line construction and or maintenance
 Operating of aerial devices
 Low Voltage operating and faultfinding

UNIT STANDARD RANGE

The range of this unit standard includes, but is not limited to standards / procedures for working on energised low voltage networks and for routine inspection / testing of insulating / isolating tools / equipment.

Safety equipment include but are not limited to approved line covers / blankets, fall-arrest systems, face

shields, safety glasses, rubber gloves, overhauls, hard hats and shoes. Insulated tools include, but are not limited to screwdrivers, diagonal cutters, pliers, cable knives, crimping pliers, spanners and wire strippers. Test equipment for work on energised circuits will include, but are not limited to multimeters, ammeters, phase rotation testers and voltage detectors. Test equipment for routine tests will include, but are not limited to and insulation resistance testers and stick testers.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Prepare to do work on energised low voltage networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Job instructions are obtained and the affected electrical circuits to be inspected / maintained / repaired is identified according to geographical / electrical network diagrams.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Task instructions are interpreted and a sequence of operation is planned.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The affected section of the network is arranged according to job instructions / maintenance schedules or breakdown reports where necessary.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Insulated / insulating equipment for work on energised circuits is inspected, cleaned and transported in accordance with energised work standards and procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 5

5. Appropriate lifting equipment / machines are identified, selected, inspected, cleaned and transported according to statutory requirements and energised work standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Perform work on energised low voltage networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The affected section of the network is identified for work according to job instructions / maintenance schedules or breakdown reports where necessary.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Work area / structure configuration is assessed to identify unsafe / hazardous conditions and discussed with work team according to statutory requirements and safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Maintenance/ repairs on low voltage circuits is carried out in accordance with the standards / procedures for work done on energised networks.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Safety precautions / procedures are followed before, during and after inspection and testing installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 3

Complete the work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. All equipment is removed from the affected section of the network as per job procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Perform necessary tests on the circuit and record results as per job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Insulated / insulating equipment is inspected, cleaned and stored in accordance with relevant standards and procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Appropriate lifting equipment / machines are inspected, cleaned and stored according to statutory requirements and relevant standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Documentation is completed and submitted according to data management procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Carry out routine inspections and test of equipment used for work on energised low voltage networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. The appropriate inspection sheets and test equipment are obtained as per statutory requirement.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The relevant insulated / insulating tools and equipment are cleaned prior to inspection and testing.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Carry out routine inspections and record results as per statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Carry out routine testing and record results as per statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Ensure that the relevant insulated / insulating tools and equipment's certificates are valid and in place as per statutory requirements / data management systems.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. The relevant insulated / insulating tools and equipment are stored as per relevant standards and procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A thorough understanding and skills in the utilisation of tools and equipment used for energised work.
- > A basic understanding and knowledge of environmental and safety standards.

- > A comprehensive understanding and knowledge of applicable standards / procedures for work on energised low voltage networks.
- > Able to read and interpret network drawings; diagrams and instructions.
- > Able to use a range of approved cleaning / anti-corrosion materials safely & effectively.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING**

Organise oneself and one's activities responsibly and effectively when working in a work team and ensure safe execution of work activities.

UNIT STANDARD CCFO COLLECTING

Collect, organise and critically evaluate information related to inspection, maintenance and repairs on energised low voltage networks.

UNIT STANDARD CCFO COMMUNICATING

Effective use of communication methods when giving instructions to team members / following instructions of team leader.

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING**

Carry out tasks making responsible decisions during the use and choice of relevant insulating / isolating / personal protective equipment and safety equipment.

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

Supplementary information:

- > This unit standard can be assessed in a workplace environment, or in a training or educational environment if simulated equipment response and examples can be provided, or in a combination of both environments.
- > Performance in relation to the elements must comply with current legislation, especially the OHS Act and their subsequent amendments, electricity supply industry codes of practice and documented procedures. A full list of current legislation and industry codes is available from the SETA.
- > Reference to terms, procedures, and specifications in this unit standard may be taken as including documented procedures and specifications relevant to the workplace in which assessment is carried out.
- > Performance in relation to the elements must comply with Industry operating regulations for low voltage systems.
- > All work practices shall meet documented industry maintenance standards, including the quality management requirements, and the documentation of activities, events, and decisions.

Specified requirements

Legal requirements:

SABS 0142
OHS Act
Local Authority



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

26

Install / replace mini substations and ring-main units / switches

SAQA US ID		UNIT STANDARD TITLE	
113891		Install / replace mini substations and ring-main units / switches	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL
PPC-EIC-0-SGB ECC		Regular	Level 3
			CREDITS
			6
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the electrical distribution environment.

The person credited with this unit standard is capable of planning, installing / replacing Medium Voltage mini substations and ring-main units / switches according to statutory requirements to distribute and control electricity to electrical installations.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical construction- and distribution environment.

LEARNING ASSUMED TO BE IN PLACE

- > Apply & maintain safety in an electrical environment (L2 Unit Standard)
- > Basic hand tools
- > Portable power tools
- > Introduction to industry
- > Maintain safety at road works in urban areas (L2 Unit Standard)
- > Plan, install & terminate electrical cables & conductors
- > Basic rigging skills
- > Operating of mobile crane
- > Read and relate to drawings, circuits and diagrams

UNIT STANDARD RANGE

Mini substations include, but are not limited to:

- > Type A and Type B mini substations
- > 11kV / 400V, 22kV / 400V & 33kV / 400V
- > 200kVA - 1000kVA for all mini substations

Ring-main units / switches include:

- > Fused & non-fused, stand-alone & extendable, indoor & outdoor units
- > 11kV, 22kV & 33kV

Medium Voltage cables / terminations are limited to:

- > Disconnecting & re-connecting cable glands / terminations

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan to install mini substation, ring-main unit or switch.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The unit's site location / point number, type and kVA / kA rating established according to geographical / system electrical diagrams and project plan specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Job instructions are obtained and outage arranged according to pre-task plans and project requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The unit obtained, pre-commissioning tests arranged and test certificates submitted according to pre-commissioning procedures and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Tools, materials, transport / rigging and safety equipment required for installing the unit are selected and checked for functionality according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Prepare to install mini substation, ring-main unit or switch.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. The unit is loaded and transported to the installation site as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Work site is inspected for hazardous conditions and corrective action is taken according to Occupational Health and Safety Act requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Work area is demarcated / barricaded according to statutory requirements and roadwork safety procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Plinth and trenches are prepared according to manufacturer's specifications / project requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Earth mats / straps prepared and installed according to project requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Remove the mini substation, ring-main unit or switch.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Ensure that the unit to be replaced is isolated, earthed and permits in place / worker's register signed as per high voltage operating regulations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. Earth straps, Medium-and Low Voltage cables are marked and disconnected as per work site requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The unit is rigged and removed from the plinth according to safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Tools, rigging and personal protective equipment is used safely according to job specifications and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Assess the site for possible irregularities prior to the new installation as per safety risk assessment procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Install mini substation, ring-main unit or switch.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The unit is positioned and secured according to statutory requirements and worksite procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Earthing conductor / straps are terminated according to job specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

provider through the relevant ETQA by SAQA.

3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

4. To be determined by ETQA in consultation with NSB.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Specific requirements of SABS 0142 - 1
- > Calculate prospect short circuit current
- > SABS 1765 Safety specifications for distribution boards below 10 kA? Occupational Health & Safety Act (Act 85 of 1993) and regulations
- > SABS 0142-1
- > Knowledge about type two co-ordination
- > Duties of a distribution evaluator
- > ISO quality management systems
- > Authorised marks of approval and authorisation
- > Certificate of Compliance

Knowledge that will help me understand and that I will be able to explain:

- > Types of R C C compliant or SABS certified materials and components
- > Interpretation of the relevant requirements of SABS 0142-1
- > Fault finding techniques
- > Importance of safety for the authorized operating and maintenance personnel
- > The importance of accurately recording data and test results
- > Approved SABS codes relating to electrical equipment
- > The extent of consequential losses in case of a failure of the assembly

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identify and solve problems (identification of defects and deficiencies) and propose cost effective solutions

UNIT STANDARD CCFO WORKING

Work effectively with others (during the testing and inspection of an assembly)

UNIT STANDARD CCFO ORGANIZING

Organise and manage oneself (identification and selection of appropriate documentation and electrical test equipment)

UNIT STANDARD CCFO COLLECTING

Collect, analyse, organise and critically evaluate information (during the inspection and testing of the installation)

Compile a findings report

UNIT STANDARD CCFO COMMUNICATING

UNIT STANDARD CCFO SCIENCE

UNIT STANDARD CCFO DEMONSTRATING

Interpret the respective requirements of SABS 0142-1 clause 6.6

Interpretation on statutory requirements

ASSESSMENT CRITERION 3

3. Waste materials are disposed of according to environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Necessary documentation is completed and submitted to designated personnel.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A basic understanding of stores procedures.
- > A basic understanding of the reticulation network layout.
- > A basic knowledge of mini substations, ring-main units / switches, its connecting / rigging points / lashing and transporting requirements.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING**

Organise oneself and one's activities responsibly and communicate effectively during planning, preparing and performing the task.

UNIT STANDARD CCFO COLLECTING

Collect, evaluate, organise and critically evaluate information related to installing and replacing mini substations, ring-main units / switches so that these are accurately interpreted into application performance standards.

UNIT STANDARD CCFO COMMUNICATING**UNIT STANDARD CCFO SCIENCE**

UNIT STANDARD CCFO DEMONSTRATING**UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary information

Specified requirements

Legal requirements:

Relevant sections of the OHS Act

Relevant environmental management processes / procedures



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

27

Install batteries

SAQA US ID		UNIT STANDARD TITLE	
113902		Install batteries	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 3	4
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector.

A person credited with this unit standard will be able to:

Install batteries in accordance with statutory requirements and to distribute and control DC to electrical apparatus.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Introduction to industry.
- > Select, use and care of relevant tools and equipment.
- > Statutory requirements.

UNIT STANDARD RANGE

This unit standard applies to persons (doing what) (with what level of authority or independence)

Statutory requirements includes but is not limited to:

- a. OHSA,
- b. Relevant SABS specifications,
- c. Local Authority requirements,
- d. Manufacturers specifications
- e. Worksite procedures.

Worksite procedures include but are not limited to:

- a. Written or verbal procedures,
- b. Formal and informal methods.

Batteries include primary batteries, secondary batteries for stationary and mobile installations.

Preparation includes but is not limited to:

- a. Ventilation,
- b. Doors open,
- c. Symbolic safety signs,
- d. Eye wash bowl,
- e. Safety shower,
- f. First aid kit,
- g. Running water,
- h. Lighting
- i. Antistatic precautionary methods

Defects include but are not limited to:

- a. Cracks, leaks

Loose terminals

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan work task.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Job instructions are interpreted and a sequence of operation is determined according to standard procedures.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. Appropriate tools, equipment and materials are selected and checked to meet the requirements of the task.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. Mechanical aids and handling equipment are organised according to the job requirements.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 4

4. Appropriate drawings / documentation are acquired in accordance with job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Appropriate personal protective equipment (ppe) is selected in accordance with the statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Correct battery is selected according to work instruction.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. Affected parties are liaised with and informed in accordance with local reporting procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Prepare work area.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Work area is inspected and prepared according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Authorisation is obtained according to worksite procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Safety of working area is ensured according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Personal protective equipment is used according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Installation of batteries.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Battery and fixtures are positioned and secured in accordance with job instructions, specifications and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Battery cells are filled with electrolyte in accordance with manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Work is performed in accordance with safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Battery condition is checked for defects according to maintenance procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 5

5. Defective batteries are reported and recorded, when necessary, according to standard procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Work area is restored to serviceable condition according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Reports / documentation and drawings are completed and returned according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Completion of job is reported according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Disposal of scrap material and storage of surplus material is carried out according to statutory requirements and standard procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > SABS specifications
- > OHSA, NO 85 OF 1993
- > Manufacturers manuals

Knowledge that will help me understand and that I will be able to explain:

- > Terminology associated with batteries.
- > Working principles of batteries.
- > How to install batteries.
- > How to complete documentation

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems (deviations from statutory requirements are identified, and reported).

UNIT STANDARD CCFO WORKING

Work effectively with others (affected parties are liased with and informed).

UNIT STANDARD CCFO ORGANIZING

Organise and manage oneself (plan, select, organise work tasks).

UNIT STANDARD CCFO COLLECTING

Collect, organise and critically evaluate information (worksite preparation).

UNIT STANDARD CCFO COMMUNICATING

Communicate (affected parties are liased with and informed).

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

N/A



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

28

Lower, inspect service and maintain a stand-alone battery charging wind turbine

SAQA US ID	UNIT STANDARD TITLE		
113885	Lower, inspect service and maintain a stand-alone battery charging wind turbine		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 3	5
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector

A person accredited with this unit standard will be able to:

- > Plan to lower, inspect, service and maintain a stand-alone battery charging wind turbine
- > Prepare to lower, inspect, service and maintain a stand-alone battery charging wind turbine
- > Lower, inspect, service and maintain a stand-alone battery charging wind turbine
- > Conclude the inspection, service and maintenance of a stand-alone battery charging wind turbine.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Electrical safety
- > Cleaning methods
- > Basic rigging
- > Basic safety procedures related to tools
- > Use of portable electrical cleaning equipment
- > Communication and numeracy
- > Use of hand tools and test instruments
- > Unit Standard on the installation and commissioning of a wind turbine

UNIT STANDARD RANGE

- > In line with OHS Act standards
- > Manufacturers specifications
- > 3 phase AC permanent magnet alternators
- > DC generators

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan to lower, inspect, service and maintain a wind turbine.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Task instructions are obtained and understood (Interpreted).

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Job cards / works requests / maintenance schedules.

ASSESSMENT CRITERION 2

2. Identify the correct personal protective equipment as per your work place procedure.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Overalls; Aprons; Safety Glass; Face Shields; Masks.

ASSESSMENT CRITERION 3

3. Identify correct cleaning solvents and material as per your work place procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Waste; Rags; Chemical solvents; Brushes.

ASSESSMENT CRITERION 4

4. Identification of correct breakers for isolation of circuits for servicing and maintenance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Isolation and locked out.

SPECIFIC OUTCOME 2

Prepare to lower, inspect, service and maintain a stand-alone photovoltaic supplied pump.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Select correct cleaning solvents and material as per your work place procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Waste; Rags; Chemical solvents; Brushes.

ASSESSMENT CRITERION 2

2. Select applicable portable electrical cleaning equipment as per work place procedures and standards

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Blowers; Electrical Extension leads; Vacuum Cleaners.

ASSESSMENT CRITERION 3

3. Select and wear the correct personal protecting equipment as per your work place procedure.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Overalls; Aprons ; Safety Glass; Face Shields ; Masks.

ASSESSMENT CRITERION 4

4. Confirm that batteries, charge regulator and wind turbine are isolated and locked out as per procedure.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Verbal; written (permit system) permission to work.

ASSESSMENT CRITERION 5

5. Winch and gin pole is mounted in position in readiness for lowering procedure.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Lower, inspect, service and maintain wind turbine.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Wind turbine is lowered until it comes to rest on trestle.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. Visually inspect the wind turbine and charge regulator for defects.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Doors, hinges, locking devices, blades, mast, bolts, bearings, slip rings, structural damage, weather seal, rust, faded paint, moisture, dust, burnt insulation, name plates and labels.

ASSESSMENT CRITERION 3

3. Clean charge regulator, blades, alternator/generator, slip rings and mast using the approved cleaning materials, techniques and solvents as per work place standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Correct and safe use of cleaning materials and equipment as per safety standards are demonstrated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Appropriate use of personal protective equipment during the cleaning process as per safety standard or work procedures are demonstrated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Repair and replace damaged components.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Hinges, locking / latching devices, doors, blades, mast, bolts, bearings, slip rings etc.

ASSESSMENT CRITERION 7

7. Consequences of incorrect use of cleaning methods, solvents and materials are explained in accordance with work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 8**

8. Wind turbine and charge regulator are serviced and maintained as per manufacturer's manuals and instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 4

Conclude the maintenance of a stand-alone battery charging wind turbine.

OUTCOME NOTES**OUTCOME RANGE**

General house keeping; records; reports and re-energising and erection.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. All defects and suspected faults are recorded and reported in line with specific work site requirements

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

History files; job cards; maintenance reports.

ASSESSMENT CRITERION 2

2. The correct disposal of the used cleaning solvents and rags as per safety and environmental standards are demonstrated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Flammable material drums; waste drums; incinerators.

ASSESSMENT CRITERION 3

3. The cleaning solvents are properly sealed/closed and correctly stored to prevent hazardous fumes; substance spillage and risk of fire.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Flame proof storage; ventilated rooms.

ASSESSMENT CRITERION 4

4. All cleaning equipment is returned and stored as per work site house keeping standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. All defective components are correctly disposed off, in accordance to site procedures and standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Wind turbine is erected as per Unit Standard on the installation and erection of a stand-alone battery charging wind turbine.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

1. A basic understanding of Isolation and Lockout procedures.
2. Related work place / site standards and procedures.
3. A basic understanding of cleaning material and solvents.
4. A basic understanding of the effects of certain cleaning solvents when applied to various parts / materials of a wind turbine and charge regulator.
5. A basic understanding of the handling of chemicals and solvents.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING**

Organise oneself and one's activities responsibly and effectively in the ability to follow instructions when working under supervision to ensure the safe execution of work activities.

UNIT STANDARD CCFO COLLECTING

Collect, evaluate, organise and critically evaluate information related to (isolation / lockout procedures of electrical equipment thus ensuring safe execution of work).

UNIT STANDARD CCFO COMMUNICATING

Effective use of communication methods when recording and reporting information.

UNIT STANDARD CCFO SCIENCE

Use science and technology effectively and critically, showing responsibility towards the environmental and the health of others by complying to the environmental Management and Safety standards when using chemical solvents and hazardous substances.

UNIT STANDARD CCFO DEMONSTRATING**UNIT STANDARD CCFO CONTRIBUTING**

Tasks using responsible thinking and decision making in relation to the use and choice of relevant personal protective equipment.

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

Supplementary information:

Specified Requirements

Legal Requirements:

SABS 0142

Relevant sections of the OHS Act

Relevant environmental management processes / procedures

A glossary of terms about the terminology of:

Context Specific

- > Manufacturer's specifications in relation to cleaning solvents
 - > Lockout system
 - > Work site / safe work policies and procedures
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

29

Install and terminate Medium/High Voltage cables

SAQA US ID	UNIT STANDARD TITLE		
113862	Install and terminate Medium/High Voltage cables		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 4	6
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering, Distribution and Construction environment.

A person credited with this unit standard will be capable of:

- > Planning, installing, terminating and testing of Medium/High voltage cables according to manufacturer's specifications.

This unit standard will contribute to the full development of the learner within the electrical engineering, distribution and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and up-liftment within the electrical engineering, distribution and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and/or equivalent:

- > Use and knowledge of electrical testing instruments
- > Introduction to industry
- > Knowledge of electrical drawings
- > Knowledge of isolating and safety testing procedures
- > Basic hand tools

UNIT STANDARD RANGE

- > Materials include, but are not limited to Medium/High Voltage cables, solid or stranded conductors, glands, shrouds, lugs, termination boxes, heat/cold shrinks termination kits, lubricants, solvents and approved insulation materials (tapes, putties, resins, compounds).
- > Tests on Medium/High Voltage cables are limited to phasing, continuity, short circuit, earth resistance, open circuit and high resistance.
- > Statutory requirements include but are not limited to OSH Act, SABS, Authority requirements, manufacturers specifications and worksite procedures.
- > Specialised tools to be used for medium voltage cables may include but are not limited to Medium/High Voltage testers, gas torch, hydraulic cable cutters and crimpers, cable stands/trestles/jacks, rollers.
- > Medium Voltage cables (> 1000V, up to & including 33kV) may include but are not limited to lead, PVC, XPLI and PILC types.

> High Voltage cables (> 33kV, up to & including 132kV) may include but are not limited to lead, PVC, XPLE and PILC types.

> Cable ways include, but are not limited to trenches, ducts, metal frames, indoor/outdoor and underground.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan to install Medium/High Voltage cables.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Planning details are determined according to given instructions and project requirements.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. Appropriate wayleaves, drawings and relevant documentation are acquired in accordance with project/job specifications.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. Materials and tools are selected according to project/job requirements.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 4

4. Applicable test equipment is selected and checked for functionality.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 5

5. Relevant parties are liaised with and notified according to worksite procedures.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

SPECIFIC OUTCOME 2

Prepare the Medium/High Voltage cable ways and work areas.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Cable ways to be prepared and obstructions removed according to cable laying specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The correct cable is identified, obtained and delivered as per project/job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The cable is tested and inspected for electrical/physical defects prior to installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Ensure that the cable to be worked on is at zero potential by discharging and capped as per safety standards, procedures and work requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Work area is assessed for unsafe/hazardous conditions according to statutory requirements and safe work procedures (barricading/shoring).

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Install Medium/High Voltage cables.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Applicable tools and equipment are selected and used safely to meet the requirements of the job.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Cable is run out and laid in the cableway according to manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Shoring is removed, cable trenches are backfilled with appropriate sand/soil and cable marker tape installed according to work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The backfilled soil is compacted as per soil density requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Terminate Medium/High Voltage cables.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Applicable tools and equipment are selected and used safely to meet the requirements of the job.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Cable ends are phased, discharged and prepared for terminating according to manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Cable gland is positioned; assembled and secured according to manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Cable cores are visually phased, aligned, made-off, and terminated according to manufacturer's numbering/colour coding specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Insulation resistance/continuity/phasing and mechanical tests are carried out on cable/completed joint

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. The cable termination box covers/cover plates are installed/closed and filled with insulation compounds/resins as per manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 5**

Complete the work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Backfilled excavations are restored to original condition as per customer agreement.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Work area is left clear of surplus/waste materials in accordance with environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Applicable tools and equipment are cleaned and stored according to OHS Act requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Documentation is completed and submitted according to data management procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Knowledge that will help me understand and that I will be able to explain:

- > Terminology associated with cable laying, installing, testing equipment and materials.
- > Operating principles of testing equipment.
- > Relevant sections of statutory requirements.
- > General testing principles for cable and cores.
- > Handling and application of applicable termination kits.
- > Working principles of applicable equipment and components.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems.

UNIT STANDARD CCFO WORKING

Work effectively with others as a member of a team or group.

UNIT STANDARD CCFO ORGANIZING**UNIT STANDARD CCFO COLLECTING****UNIT STANDARD CCFO COMMUNICATING**

Communicate effectively by means of language skills, oral and/or written.

UNIT STANDARD CCFO SCIENCE

UNIT STANDARD CCFO DEMONSTRATING

UNIT STANDARD CCFO CONTRIBUTING

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

N/A



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

30

Joint Medium / High Voltage cables

SAQA US ID	UNIT STANDARD TITLE		
113874	Joint Medium / High Voltage cables		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 4	8
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering, Distribution and Construction environment. A person credited with this unit standard will be capable of:

Jointing and testing of Medium and High Voltage cables according to statutory and manufacturer's specifications.

This unit standard will contribute to the full development of the learner within the electrical engineering, distribution and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering, distribution and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Use and knowledge of electrical testing instruments
- > Introduction to industry
- > Knowledge of electrical drawings
- > Knowledge of isolating and safety testing procedures

UNIT STANDARD RANGE

- > Materials may include but are not limited to Medium and High Voltage cables, solid or stranded conductors, glands, lugs, ferrules, insulation, various metals and jointing kits.
- > Tests on High Voltage cables are limited to phasing, continuity, short circuit, earth resistance, open circuit and high resistance.
- > Statutory requirements include but are not limited to OSH Act, SABS, Authority requirements, manufacturers specifications and worksite procedures.
- > Specialised tools to be used for Medium / High Voltage cable joints may include but are not limited to pulse generator, injection test set, spike gun, Medium / High Voltage insulation tester, gas torch, hydraulic cable cutters / crimpers and special jointing kits as per jointing requirements.
- > Medium / High Voltage cables may include but are not limited to lead sheath (paper insulated), PVC, XPLE and PILC types.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan to joint Medium / High Voltage cable.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Task details are determined according to fault reports or instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Appropriate drawings and documentation are acquired in accordance with job specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Materials are selected according to job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Applicable test equipment is selected and checked for functionality.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Appropriate tools are selected according to job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Relevant parties are liaised with and notified according to worksite procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 2

Prepare the Medium / High Voltage cable and work area.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The correct cable is identified and selected according to drawings and reticulation diagrams.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Isolation of the circuit is confirmed and permit is obtained according to operating regulations for High Voltage systems and worksite procedures if required.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The cable is tested to establish exact work point where necessary.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Confirm that the cable to be worked on is at zero potential by spiking and made safe as per safety standards, procedures and work requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Safety of work area is ensured according to statutory requirements and safe work procedures (barricading / shoring).

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 3

Joint Medium / High Voltage cable.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Applicable tools and equipment are selected and used safely to meet the requirements of the job.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Cable ends are phased, discharged and prepared for jointing according to manufacturer specifications

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Cable cores are joined according to manufacturer specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The cable joint is completed as per manufacturers specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Insulation resistance / continuity / phasing and mechanical tests are carried out on cable / completed joint.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete the work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. The work permit is cleared according to operating regulations for High Voltage systems and worksite procedures if required.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Work area is restored in accordance with environmental legislation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Applicable tools and equipment are cleaned and stored according to OHS Act requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Documentation is completed and submitted according to data management procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Knowledge that will help me understand and that I will be able to explain:

- > Terminology associated with testing equipment and materials.
- > Operating principles of testing equipment.
- > Relevant sections of statutory requirements.
- > General testing principles for cable and conductors.
- > Handling and application of applicable jointing kits.
- > Working principles of applicable equipment and components.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems.

UNIT STANDARD CCFO WORKING

Work effectively with others as a member of a team or group.

UNIT STANDARD CCFO ORGANIZING**UNIT STANDARD CCFO COLLECTING****UNIT STANDARD CCFO COMMUNICATING**

Communicate effectively by means of language skills, oral and / or written.

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

N/A



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

31

Spray-wash energised medium / high voltage networks

SAQA US ID	UNIT STANDARD TITLE		
113878	Spray-wash energised medium / high voltage networks		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 4	4
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the electrical distribution industry.

The person with this unit standard will be able to:

Spray-wash energised medium and high voltage substations and lines in accordance with industry requirements, work procedures, standards and statutory requirements.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard is essential for social and economic transformation and up-liftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

Safety procedures (electrical)
 Induction to industries
 Electrical drawings
 Basic safety procedures related to tools, electricity and cleaning agent
 Names and functions of Medium / High Voltage equipment and their components
 Applicable High Voltage regulation modules
 First aid level two
 Basic rigging
 Operating of aerial devices

UNIT STANDARD RANGE

The range of this unit standard includes spray-washing on energised Medium / High Voltage substation and line insulation (glass / porcelain insulators and bushings).
 Energised spray-washing tools, equipment and lifting devices include, but are not limited to water reservoirs, spray-wash plant, insulated hoses, hand sets, nozzles, insulated platforms / aerial devices.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan to spray-wash energised medium / high voltage networks

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Job instructions are obtained and the section of electrical network to be spray-washed is identified according to geographical / electrical network diagrams.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Task instructions are interpreted and a sequence of operation is planned.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Availability / serviceability of energised spray-washing equipment is ensured as per statutory and plant operation requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Handout of the affected section of the network is arranged according to job instructions / maintenance schedules or breakdown reports where necessary.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Prepare to spray-wash energised medium / high voltage networks

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. The correct type of spray-washing / lifting equipment / machines are selected according to access / clearance constraints and on-site assessment.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Spray-washing equipment is inspected, cleaned and checked for functionality in accordance with energised work standards and procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Appropriate lifting equipment / machines are inspected, cleaned and transported according to statutory requirements and energised work standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The water used for spray-washing is obtained and tested to ensure acceptable conductivity / resistivity levels as per spray-washing standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Remove pollution from medium / high voltage networks with spray-wash plant.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Handout of the affected section of the network is received according to job instructions / maintenance schedules or breakdown reports where necessary.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. Work area / structure configuration is assessed to identify unsafe / hazardous conditions and discussed with work team according to statutory requirements and safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Spray-washing of energised Medium / High Voltage network is carried out in accordance with the energised work standards / work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Safety precautions / procedures are followed before, during and after spray-wash activity.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete the work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The affected section of the network is handed back to the Control Officer according to operating regulations for High Voltage systems.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Energised spray-washing equipment is inspected, cleaned and stored in accordance with energised work standards and procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Appropriate lifting equipment / machines are inspected, cleaned and stored according to statutory requirements and energised work standards / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Documentation is completed and submitted according to data management procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 5**

Carry out routine inspections and tests of spray-wash equipment.

OUTCOME NOTES

Carry out routine inspections and tests of spray-wash equipment used on energised medium / high voltage networks.

OUTCOME RANGE**ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The appropriate inspection sheets and test equipment are obtained as per statutory requirement.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The relevant spray-washing tools / equipment are cleaned prior to inspection / testing.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Carry out routine inspections and record results as per statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Carry out routine testing and record results as per statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 5

5. Ensure that the relevant spray-washing tools and equipment's certificates are valid and in place as per statutory requirements / data management systems.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. The relevant spray-washing tools and equipment are stored as per relevant standards and procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A thorough understanding and skills in the utilisation of spray-washing / lifting equipment / machines.
- > A basic understanding and knowledge of environmental and safety standards.
- > A comprehensive understanding and knowledge of applicable spray-wash standards / procedures.
- > Able to read and interpret network drawings; diagrams and instructions

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING**

Organise oneself and one's activities responsibly and effectively when working in a work team and ensure safe execution of work activities.

UNIT STANDARD CCFO COLLECTING

Collect, organise and evaluate information related to spray-washing on energised medium / high voltage networks.

UNIT STANDARD CCFO COMMUNICATING

Effective use of communication methods when giving / receiving instructions.

UNIT STANDARD CCFO SCIENCE

UNIT STANDARD CCFO DEMONSTRATING**UNIT STANDARD CCFO CONTRIBUTING**

Carry out tasks making responsible decisions during the use and choice of relevant personal protective equipment and safety equipment.

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

Supplementary information

- > This unit standard can be assessed in a workplace environment, or in a training or educational environment if simulated equipment response and examples can be provided, or in a combination of both environments.
- > Performance in relation to the elements must comply with current legislation, especially the OHS Act and their subsequent amendments, electricity supply industry codes of practice and documented procedures. A full list of current legislation and industry codes is available from the SETA
- > Reference to terms, procedures, and specifications in this unit standard may be taken as including documented procedures and specifications relevant to the workplace in which assessment is carried out.
- > Performance in relation to the elements must comply with Industry operating regulations for high voltage systems [ORHVS]
- > All work practices shall meet documented industry maintenance standards, including the quality management requirements, and the documentation of activities, events, and decisions.

Specified requirements

Legal requirements:

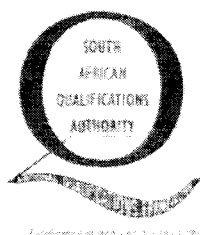
OHS Act

Local Authority

Context specific

Specific to a discipline or a industry

- > Manufacturers specifications
 - > Work site policies and procedures
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

32

Inspect, test and maintain Medium / High Voltage transformers

SAQA US ID		UNIT STANDARD TITLE	
113880		Inspect, test and maintain Medium / High Voltage transformers	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL
PPC-EIC-0-SGB ECC		Regular	Level 4
			CREDITS
			6
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector.

A person credited with this unit standard will be capable of:

Inspecting, functional testing and maintaining transformers / on-load tap changers according to manufacturer's specifications to ensure maximum efficiency and continuity of supply.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Relevant sections in statutory requirements.
- > Select, use and care for basic hand tools.
- > Select, use and care of electrical test instruments.
- > Read and interpret electrical wiring / layout diagrams.
- > Power tools (portable).
- > Inspect, test, maintain and do faultfinding on single / three phase circuits.
- > Inspect, test, maintain and do faultfinding on single / three phase AC machines and control gear.
- > High Voltage regulations for access and supervision.

UNIT STANDARD RANGE

- > Medium / High Voltage transformers include, but are not limited to 11kV - 132kV types with power ratings of 1MVA - 50MVA
- > Transformer types include, but are not limited to step-up, step-down, regulators, neutral earthing compensators / resistors, current / voltage transformers
- > Tap selectors include manual and on-load tap changers / diverter switches
- > Testing includes, but is not limited to manual / automatic operation of mechanisms (tap changers), auxiliaries (fans, pumps), equipment (Bucholtz relays, flow switches, pressure relief valves) and insulating oil sampling / testing
- > Transformer maintenance includes, but is not limited to topping up oil levels, tightening terminations /

connections / bolts, treating oil leaks, repairing / replacing contactors, switches, fuse holders, breathers, fans / motors / pumps, gaskets and rubber seals

> Tap changer maintenance includes, but is not limited to inspecting, cleaning, lubricating and repairing / replacing components in mechanism boxes, draining tap changer oil, opening, cleaning the unit / contacts and replacing components / gaskets where necessary.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan to maintain Medium / High Voltage transformers.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Planning is done in conjunction with outage scheduling and or maintenance programmes.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. Planning is integrated with other disciplines and associated equipment.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. Planning is arranged according to equipment history reports and failure rate.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 4

4. Planning is arranged according to plant availability and customer requirements and network stability.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 5

5. Temporary electric supply from alternative sources is considered and identified and made available for use of equipment during maintenance where appropriate.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

SPECIFIC OUTCOME 2

Prepare to maintain Medium / High Voltage transformers.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Ensure that the Transformer is isolated, earthed and safe to work on as per operating regulations for High Voltage systems.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Equipment, tools and personal protective equipment needed for maintenance is selected, inspected and checked for functionality and safety prior to commencement of tasks.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. All components and material required for maintaining transformer is correctly identified, selected and available for use.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Test equipment is selected, inspected and checked for functionality and safety prior to maintenance tasks.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Appropriate drawings and documentation is obtained and made available prior to commencing maintenance task.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 6

6. Work site / environmental hazards are identified and the appropriate action is taken in line with work site procedures

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Inspect, test and maintain Medium / High Voltage transformers.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Personal protective equipment is used and site specific safety procedures are adhered to throughout maintenance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The transformer is visually inspected and defects recorded as per inspection sheets / work instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The transformer's insulating medium is sampled and on-site / laboratory tests carried out as per applicable standards / procedures to determine insulation values, core deterioration / internal faults and corrective action is initiated where necessary.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The transformer mechanisms, auxiliaries and equipment are tested to ensure correct operation under manual and automatic conditions as per manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 5

5. The transformer mechanisms, auxiliaries and equipment are maintained according to job procedures / maintenance manuals.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete Work Task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Transformer auxiliaries are restored, quality checks conducted after maintenance and corrective action taken where necessary as per maintenance procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Tools and equipment used for maintenance is cleaned, checked for functionality and stored on completion of task.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Work area is cleaned after completion of task in line with housekeeping standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Waste / hazardous materials are disposed of according to site specific / environmental standards and procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 5

5. Completion of work is communicated and permit cleared as per operating regulations for High Voltage systems.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Documentation is completed and submitted according to data management procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Terminology associated with transformers.
- > Working principles of transformers and its components / protection devices.
- > Operating principles of transformers, tap changers and voltage regulators.
- > Basic understanding of laboratory tests done on insulating media and the causes of gas / moisture build-up in it.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems (deviations from statutory requirements are identified, reported and rectified).

UNIT STANDARD CCFO WORKING

Work effectively with others (affected parties are liaised with and informed).

UNIT STANDARD CCFO ORGANIZING

Organise and manage oneself (plan, select, organise work tasks).

UNIT STANDARD CCFO COLLECTING

Collect, organise and critically evaluate information (worksite preparation).

UNIT STANDARD CCFO COMMUNICATING

Communicate (affected parties are liaised with and informed).

UNIT STANDARD CCFO SCIENCE

*UNIT STANDARD CCFO DEMONSTRATING**UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA*

N/A

UNIT STANDARD NOTES

Supplementary information:

Specified requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > SABS specifications.
- > OSH Act, No 85 OF 1993.
- > Manufacturers' manuals.



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

33

Inspect, maintain, repair and do faultfinding on Medium / High Voltage networks

SAQA US ID	UNIT STANDARD TITLE		
113881	Inspect, maintain, repair and do faultfinding on Medium / High Voltage networks		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 4	8
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the electrical High Voltage distribution and transmission environment. A person credited with this unit standard will be able to do the following on High Voltage networks:

- > Visual / routine inspection and report defects.
- > Carry out routine maintenance.
- > Carry out repairs during normal and faulty conditions.
- > Carry out faultfinding during faulty conditions.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Apply and adhere to electrical safety.
- > Read & interpret station electric / network diagrams.
- > Jointing and faultfinding on low voltage cables.
- > Select, use and care for electrical measuring instruments.
- > Use and care for hand tools.

UNIT STANDARD RANGE

- > Overhead lines include but are not limited to steel / wood / concrete poles, stays, bare conductors and insulators.
- > Equipment will include, but are not limited to High Voltage structure mounted isolators, load breaks, sealing ends, surge arrestors.
- > Hardware will include, but are not limited to High Voltage wood / lattice / steel / concrete pole structures, cables, conductors, stays & struts, insulators, clamps, bolts and pre-formed products.
- > Maintaining & repairing include but are not limited to repairing / replacing of hardware and equipment.
- > Conditions include but are not limited to routine maintenance and breakdown repairs during day / night times and all weather conditions.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:***SPECIFIC OUTCOME 1***

Plan and prepare to inspect, test and maintain / repair High Voltage networks.

OUTCOME NOTES***OUTCOME RANGE*****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

4. Appropriate tools are identified and selected to meet the requirements of the task and according to statutory requirements

ASSESSMENT CRITERION NOTES***ASSESSMENT CRITERION RANGE*****ASSESSMENT CRITERION 2**

5. Tools, materials, transport / rigging and safety equipment required for installing the unit are selected and checked for functionality according to statutory requirements.

ASSESSMENT CRITERION NOTES***ASSESSMENT CRITERION RANGE*****ASSESSMENT CRITERION 3**

1. Job instructions are obtained and the section of electrical network to be inspected / maintained / repaired is identified according to geographical / electrical network diagrams.

ASSESSMENT CRITERION NOTES***ASSESSMENT CRITERION RANGE*****ASSESSMENT CRITERION 4**

2. Task instructions are interpreted and a sequence of operation is planned.

ASSESSMENT CRITERION NOTES***ASSESSMENT CRITERION RANGE*****ASSESSMENT CRITERION 5**

3. Isolation of the affected section of the network is arranged according to job instructions / maintenance schedules or breakdown reports where necessary.

ASSESSMENT CRITERION NOTES***ASSESSMENT CRITERION RANGE***

SPECIFIC OUTCOME 2

Inspect and do faultfinding on High Voltage networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Conditions are assessed and safety measures implemented according to safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2 The affected section of the electrical distribution network is visually inspected from ground level prior to testing / maintenance / repairs according to prescribed routine inspection sheets or fault finding procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Ensure that the affected section of the electrical distribution network is isolated and prepared for testing according to faultfinding / operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The applicable test instruments are selected and testing carried out according to specific task requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Safety precautions / procedures are followed before, during and after inspection and testing installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 3

Maintain / repair High Voltage distribution networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Handout of the affected section of the network is received according to job instructions / maintenance schedules or breakdown reports where necessary.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The affected electrical hardware / equipment is assessed for possible safety risks and preventative measures implemented according to safety risk assessment / safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The electrical hardware / equipment is maintained / repaired / replaced according to applicable maintenance procedures / manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The maintained / replaced electrical hardware / equipment is inspected / tested to ensure that it is operational according to quality / manufacturer's requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete the work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Work area is restored to serviceable condition according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The affected section of the network is handed back to the Control Officer according to operating regulations for High Voltage systems.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Ensure that the replaced hardware / equipment has been returned to the stores / workshop.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Appropriate tools and safety equipment are cared for and stored according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Documentation is completed according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A comprehensive understanding of High Voltage distribution network hardware and equipment.
- > A good understanding of faultfinding procedure on High Voltage networks.
- > Use tools safely, according to statutory requirements.
- > Apply basic safety procedures related to the type of work and location.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identifying and solving problems in which responsible decisions have been made regarding the maintenance / replacement of electrical line hardware / equipment.

UNIT STANDARD CCFO WORKING

Working effectively with others as a member of the electrical maintenance team.

UNIT STANDARD CCFO ORGANIZING

Organising and managing oneself and one's activities, responsibly and effectively.

UNIT STANDARD CCFO COLLECTING

Collecting, analysing, organising and critically evaluating information..

UNIT STANDARD CCFO COMMUNICATING

Communicating effectively, using visual and / or language skills by means of oral / written reports.

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

N/A



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

34

Inspect, test and maintain Medium / High Voltage earthing systems

SAQA US ID	UNIT STANDARD TITLE		
113882	Inspect, test and maintain Medium / High Voltage earthing systems		
SGB NAME	ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction	Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 4	4
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Medium / High Voltage reticulation / distribution environment. A person credited with this unit standard will be able to do the following on earthing systems for Medium / High Voltage reticulation / distribution substations and lines:

- > Routine visual inspection and report defects.
- > Carry out routine maintenance.
- > Replace defective / missing sections of earthing.
- > Carry out tests on earthing systems.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Apply and adhere to electrical safety.
- > Read & interpret station electric / network diagrams.
- > Gas welding.
- > Select, use and care for electrical measuring instruments.
- > Use and care for hand tools.

UNIT STANDARD RANGE

- > Earthed structures include but are not limited to fences, steel/ wood/ concrete poles and lattice steel structures.
- > Earthing conductors include, but are not limited to copper / steel rods, bars and multi-stranded conductors.
- > Earthed equipment will include, but are not limited to Medium / High Voltage ground / pole / structure mounted apparatus.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan and prepare to inspect, test and maintain / repair Medium / High Voltage earthing systems.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Job instructions are obtained and the section of earthing grid / network to be inspected / maintained / repaired is identified according to geographical / earthing network diagrams.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Task instructions are interpreted and operation planned.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Isolation of the affected section of the Medium / High Voltage network is arranged according to job instructions / maintenance schedules or reports where necessary.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Appropriate tools and test equipment are identified and selected to meet job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Applicable safety gear and personal protective equipment required for maintaining / repairing / replacing earthing are selected and checked for functionality according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 2

Inspect Medium / High Voltage earthing grids / networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Conditions are assessed and safety measures implemented according to safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The earthing grid / network is visually inspected according to routine inspection sheets for loose connections, corrosion and to ensure all earthing is intact / not damaged.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Ensure that the affected section of the Medium / High Voltage network is isolated and permits obtained where necessary when working in close proximity to live apparatus according to high voltage regulations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Safety precautions / procedures are followed before, during and after inspection of earthing installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Test Medium / High Voltage earthing grids / networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Conditions are assessed and safety measures implemented according to safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Ensure that the affected section of the Medium / High Voltage network is isolated and permits obtained where necessary when working in close proximity to live apparatus according to high voltage regulations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The underground earth connections are exposed and cleaned as per job procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Earth connections are bridged by means of a flexible earth lead prior to disconnecting as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. The applicable test instruments are selected and testing carried out according to specific task requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Safety precautions / procedures are followed before, during and after testing of earthing installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. Safety precautions / procedures are followed before, during and after inspection of earthing installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 4

Maintain and repair / replace earthing on Medium / High Voltage networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The affected earthing installation is assessed for possible safety risks and preventative measures implemented according to safety risk assessment / safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Ensure that the affected section of the Medium / High Voltage network is isolated and permits obtained where necessary when working in close proximity to live apparatus according to high voltage regulations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Earth connections are bridged by means of a flexible earth lead prior to disconnecting as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Earthing is maintained / repaired / replaced according to applicable maintenance procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Safety precautions / procedures are followed before, during and after inspection of earthing installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 5

Complete the work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Work area / excavations are restored to serviceable condition according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Completion of job is reported and work permits cleared where necessary according to high voltage regulations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Ensure that the replaced earthing has been returned to the stores.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Appropriate tools and safety equipment are cared for and stored according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Documentation is completed and submitted according to data management procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Knowledge that will help me understand and that I will be able to explain:

- > A broad understanding of Medium / High Voltage earthing systems, hardware and equipment.
- > A comprehensive understanding of testing procedure on Medium / High Voltage earthing systems.
- > An appropriate understanding of earthing theory, electrical induction and discharging principles.
- > Use relevant tools and test instruments safely, according to work site procedures.
- > Apply basic safety procedures related to the type of work and location.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identifying and solving problems in which responsible decisions have been made regarding the inspecting, testing, maintaining, repairing and replacing of Medium / High Voltage earthing systems.

UNIT STANDARD CCFO WORKING

Working effectively with others as a member of the maintenance team.

UNIT STANDARD CCFO ORGANIZING

Organising and managing oneself and one's activities, responsibly and effectively.

UNIT STANDARD CCFO COLLECTING

Collecting, analysing, organising and critically evaluating information.

UNIT STANDARD CCFO COMMUNICATING

Communicating effectively, using visual and / or language skills by means of oral / written reports.

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTESN/A



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

35

Install / replace high voltage equipment and hardware

SAQA US ID	UNIT STANDARD TITLE		
113883	Install / replace high voltage equipment and hardware		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 4	6
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the electrical distribution station environment.

The person credited with this unit standard is capable of planning, installing & replacing, High Voltage equipment (current / voltage transformers, isolators, breakers, surge arrestors) according to statutory requirements to distribute and control electricity to electrical installations.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

- > Apply & maintain safety in an electrical environment (L2 Unit Standard).
- > Basic hand tools.
- > Portable power tools.
- > Introduction to industry.
- > Plan, install & terminate electrical cables & conductors.
- > Basic rigging skills.
- > Operating of Mobile crane.
- > Read and relate to drawings, circuits & diagrams.
- > Operating regulations for High Voltage systems - responsible person.

UNIT STANDARD RANGE

High Voltage equipment include, but are not limited to:

- > Structure mounted types
- > Above 33kV, up to and including 132kV

High Voltage cables / conductor terminations include, but are not limited to:

- > Disconnecting & re-connecting cable glands / terminations
- > Disconnecting & re-connecting of droppers / jumpers
- > Disconnecting & re-connecting earth straps

Hardware includes, but is not limited to:

- > Lattice steel / support structures, fixing bolts and nuts
- > Cable glands / gland plates
- > Conductor droppers / jumpers
- > Connector / termination clamps, conductor spreaders / "dog bones"

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan to install High Voltage equipment.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. The unit's site location / point number, type and kVA / kA rating established according to system electrical diagrams and project plan specifications.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. Job instructions are obtained and outage arranged according to pre-task plans and project requirements.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. The unit obtained, pre-commissioning tests arranged and test certificates submitted according to pre-commissioning procedures and statutory requirements.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 4

4. Tools, materials, transport / rigging and safety equipment required for installing the unit are selected and checked for functionality according to statutory requirements.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

SPECIFIC OUTCOME 2

Prepare to install High Voltage equipment.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The unit is loaded and transported to the installation site as per safe work procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Worksite is inspected for hazardous conditions and corrective action is taken according to Occupational Health and Safety Act requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Work area is demarcated / barricaded according to statutory requirements / operating regulations for High Voltage systems.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Lattice structure / equipment base plate prepared for installation according to manufacturer's specifications / project requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Earth straps prepared and installed according to project requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 3

Remove High Voltage equipment.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

5. Tools, rigging and personal protective equipment are used safely according to job specifications and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

4. The unit is rigged and removed from the lattice structure.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

1. Assess the site for access and clearances / constraints prior to new installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

2. Ensure that the unit to be replaced is isolated, earthed and permits in place / worker's register signed as per operating regulations for High Voltage systems.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

3. Earth straps, auxilliary cables / terminations and droppers / jumpers are suitably marked and disconnected.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 4

Install High Voltage equipment.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The new unit is rigged, positioned and secured according to statutory requirements and worksite procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Earthing conductor / straps are terminated according to job specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Auxiliary cables are terminated according to electrical cabling diagrams and job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. High Voltage droppers / jumpers are terminated and torqued correctly according to manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Tools, rigging and personal protective equipment are used safely according to job specifications and statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 5

Complete work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Work area is cleaned after completion of task according to housekeeping standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Ensure that the replaced unit has been returned to the stores / workshop.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Waste materials are disposed of according to environmental requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Necessary documentation is completed and submitted to designated personnel.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A basic understanding of stores procedures.
- > A basic understanding of the High Voltage substation / yard layout.
- > A basic knowledge of High Voltage equipment, its connecting / rigging points / lashing and transporting requirements.
- > A thorough understanding of dangers attached to working in High Voltage yards.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING**

Organise oneself and one's activities responsibly and communicate effectively during planning, preparing and performing the task.

UNIT STANDARD CCFO COLLECTING

Collect, evaluate, organise and critically evaluate information related to installing and replacing High Voltage equipment so that these are accurately interpreted into application performance standards.

UNIT STANDARD CCFO COMMUNICATING**UNIT STANDARD CCFO SCIENCE****UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information:

Specified Requirements

Legal Requirements:

- > Relevant sections of the OHS Act
- > Relevant environmental management processes / procedures



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

36

Design a stand alone renewable energy system

SAQA US ID	UNIT STANDARD TITLE		
113888	Design a stand alone renewable energy system		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 4	10
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector

A person credited with this unit standard will be able to:

- > Identify symbols and components
- > Understand and describe the functioning of circuits and components
- > Sketch and construct a stand-alone photovoltaic circuit
- > Analyse solar and wind data
- > Calculate and determine loads
- > Calculate and determine appropriate battery ratings
- > Calculate and determine appropriate solar array ratings
- > Calculate and determine appropriate wind turbine ratings
- > Use computer software available for design purposes
- > Select the most appropriate components for the system
- > Complete task

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Introduction renewable energy.
- > The function of the components in a renewable energy system.
- > Safe working procedures.
- > Good housekeeping.
- > Knowledge of the tools pertaining to the construction and wiring of renewable energy systems.

UNIT STANDARD RANGE

- > Symbols and components (ISO and IEC standard)
 - a. Contactors.
 - b. Protection (fuses, circuit breakers, earth leakage and over load relays).
 - c. Controls (temperature, pressure, level, and time switches).

- d. Loads (resistive and inductive).
- e. Inverters (Maximum 250 volt).
- > Circuits to be constructed in a simulated environment and tested under supervision.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Identify symbols and components.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

- 1. Various types of switches are identified according to their symbols.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

- 2. Various types of protection devices are identified according to their symbols.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

- 3. Various types of control devices are identified according to their symbols.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

- 4. Various types of load devices are identified according to their symbols.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

- 5. Renewable energy system components are identified according to their symbols.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 2

Sketch a basic renewable circuit diagram.

OUTCOME NOTES**OUTCOME RANGE**

Circuits are limited to those in the NRS 052.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. Instructions are interpreted according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Symbols used conform to ISO standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The function of each component is understood and described correctly.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Circuit diagrams are sketched neatly and symmetrically according to instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Circuit diagrams are functional according to instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Calculate a typical solar home or solar school load.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Appliance loads are correctly identified as per data plates.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Approximate time of use is correctly determined for each appliance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The total kWhr load is correctly calculated for the system.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Assess renewable energy resource.

OUTCOME NOTES**OUTCOME RANGE**

Wind and solar.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. Data manuals are correctly identified according to geographical location.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Data is correctly analysed for application.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Adjustments for height(wind data) are correctly carried out.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. Data is correctly applied to determine the average available energy.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Written data, records, electronic data.

SPECIFIC OUTCOME 5

Calculate battery bank rating.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. KWhr load value is correctly converted to Ahr value.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Battery losses are taken into account.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The autonomy correction is made based on available data.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 6**

Calculate the solar array and/or wind turbine rating.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Solar array and/or wind turbine rating is correctly calculated as per available resource and load data and manufacturers specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. Winter and summer variations are taken into account.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Other factors such as dirt build up and performance deterioration through aging etc are taken into account.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. System losses are included.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 7**

Selected wire sizes correctly.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Specifications in regards to minimum voltage drop is explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Wire size tables are identified and explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Wire sizes are correctly selected as per specifications and standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant

ETQA.

2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Safety precautions.
- > Knowledge about conductors and insulation material.
- > The effect of current. (Energy and power).
- > The definition of OHM's law.
- > Knowledge about electromagnetism.
- > Recording and reporting of defects in equipment and tools.
- > Operation of renewable energy system components.
- > Alternating current and direct current circuits.
- > Regulations pertaining to the task (SABS and NRS).

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identify and solve problems during the application and maintaining of electrical safety.

UNIT STANDARD CCFO WORKING

Work effectively with others while applying and maintaining electrical safety.

UNIT STANDARD CCFO ORGANIZING

Organize and manage oneself during the construction of circuits.

UNIT STANDARD CCFO COLLECTING

UNIT STANDARD CCFO COMMUNICATING

Communicate through reporting.

UNIT STANDARD CCFO SCIENCE

Use science and technology in environmental and personal safety.

UNIT STANDARD CCFO DEMONSTRATING

Demonstrate an understanding of the world as a set of related systems.

UNIT STANDARD CCFO CONTRIBUTING

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

Supplementary information:
Specified requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > SABS
- > NRS

- > OHS Act
- > Applicable statutory requirements

A glossary of terms about the terminology of
Context specific:

- > User manuals supplied by manufacturers
 - > Single phase and DC electrical systems.
 - > Specifications, agreements, policies and procedures.
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

37

Design a wind/solar hybrid system

SAQA US ID		UNIT STANDARD TITLE		
113890		Design a wind/solar hybrid system		
SGB NAME		ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction		Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION		
Physical Planning and Construction		Electrical Infrastructure Construction		
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC		Regular	Level 4	5
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER	

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector.

A person credited with this unit standard will be able to:

- > Identify symbols and components
- > Understand and describe the functioning of circuits and components
- > Sketch and construct a stand-alone photovoltaic circuit
- > Analyse solar and wind data
- > Calculate and determine loads
- > Calculate and determine appropriate battery ratings
- > Calculate and determine appropriate wind/solar hybrid ratings
- > Use computer software available for design purposes
- > Select the most appropriate components for the system
- > Complete task

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and/or equivalent:

- > Introduction renewable energy
- > The function of the components in a renewable energy system
- > Unit standard "Design a stand alone renewable energy system"
- > Safe working procedures
- > Good housekeeping.
- > Knowledge of the tools pertaining to the construction and wiring of renewable energy systems.
- > The ability to process data electronically using spreadsheets

UNIT STANDARD RANGE

- > Symbols and components (ISO and IEC standard)

- a. Contactors.
- b. Protection (fuses, circuit breakers, earth leakage and over load relays).
- c. Controls (temperature, pressure, level, and time switches).
- d. Loads (resistive and inductive).
- e. Inverters (Maximum 250 volt).
- > Circuits to be constructed in a simulated environment and tested under supervision.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Wind and solar resource is assessed to determine viability.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

- 1. Data manuals are correctly identified according to geographical location.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

- 2. Data is correctly analysed for application.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

- 3. Adjustments for height (wind data) are correctly carried out.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

- 4. Data is correctly applied to determine the average available energy.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Written data, records, electronic data.

SPECIFIC OUTCOME 2

Assessment of wind and solar resource data for wind/solar hybrid feasibility.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Daily graphical representations of wind and solar data is compared for compatibility and explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Annual graphical representations of wind and solar data is compared for compatibility and explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Supplementary features between wind and solar data is identified and explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Development and assessment of a load profile.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. A daily load profile is developed.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. An annual load profile is developed.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. The load profiles are assessed and explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Assessment of wind and solar resource data for optimised load compatibility.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The load profiles are assessed against the relevant wind and solar data and explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Wind and solar data profiles are assessed and their compatibility with each other and the load explained in terms of a hybrid system.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 5**

Calculation of photovoltaic array and wind turbine rating.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Best case scenario for wind/solar hybrid is calculated and explained as per the available resource data, load data and manufacturers specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Cost effectiveness of results is tested and explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. The calculations in 1 and 2 is repeated in an iterative process to obtain the best results.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Knowledge that will help me understand and that I will be able to explain:

- > Safety precautions.
- > Knowledge about conductors and insulation material.
- > The effect of current. (Energy and power)
- > The definition of OHM's law.
- > Knowledge about electromagnetism.
- > Recording and reporting of defects in equipment and tools.
- > Operation of renewable energy system components
- > Alternating current and direct current circuits.
- > Regulations pertaining to the task (SABS and NRS)
- > Wind and solar data processing

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems during the application and maintaining of electrical safety.

UNIT STANDARD CCFO WORKING

Work effectively with others while applying and maintaining electrical safety.

UNIT STANDARD CCFO ORGANIZING

Organize and manage oneself during the design of a hybrid energy system.

UNIT STANDARD CCFO COLLECTING**UNIT STANDARD CCFO COMMUNICATING**

Communicate through reporting.

UNIT STANDARD CCFO SCIENCE

Use science and technology in environmental and personal safety.

UNIT STANDARD CCFO DEMONSTRATING

Demonstrate an understanding of the world as a set of related systems.

UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information

Specified Requirements:

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

SABS

NRS

OHS Act

Applicable statutory requirements

A glossary of terms about the terminology of:

Context Specific

User manuals supplied by manufacturers

Single phase and DC electrical systems.

Specifications, agreements, policies and procedures



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

38

Design a solar pump system

SAQA US ID		UNIT STANDARD TITLE	
113892		Design a solar pump system	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL
PPC-EIC-0-SGB ECC		Regular	Level 4
			CREDITS
			4
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector.

A person credited with this unit standard will be able to:

- > Identify symbols and components
- > Understand and describe the functioning of circuits and components
- > Sketch and construct a solar pump circuit
- > Analyse solar data
- > Make pump selections
- > Calculate and determine appropriate battery ratings
- > Calculate and determine appropriate solar array ratings
- > Calculate and determine appropriate wind turbine ratings
- > Use computer software available for design purposes
- > Select the most appropriate components for the system
- > Complete task

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Introduction renewable energy
- > The function of the components in a renewable energy system
- > Safe working procedures
- > Good housekeeping.
- > Knowledge of the tools pertaining to the construction and wiring of renewable energy systems.

UNIT STANDARD RANGE

> Symbols and components (ISO and IEC standard)

- a. Contactors.
- b. Protection (fuses, circuit breakers, earth leakage and over load relays).
- c. Controls (temperature, pressure, level, and time switches).
- d. Loads (resistive and inductive).
- e. Inverters (Maximum 250 volt).

> Circuits to be constructed in a simulated environment and tested under supervision.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Identify symbols and components.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Various types of switches are identified according to their symbols.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Various types of protection devices are identified according to their symbols.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Various types of control devices are identified according to their symbols.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Various types of load devices are identified according to their symbols.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 5

5. Renewable energy system components are identified according to their symbols.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Sketch a basic renewable circuit diagram.

OUTCOME NOTES**OUTCOME RANGE**

Circuits are limited to those in the NRS 052.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. Instructions are interpreted according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Symbols used conform to ISO standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The function of each component is understood and described correctly.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Circuit diagrams are sketched neatly and symmetrically according to instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Circuit diagrams are functional according to instructions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 3

Calculate a typical solar home or solar school load.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Appliance loads are correctly identified as per data plates.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Approximate time of use is correctly determined for each appliance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The total kWhr load is correctly calculated for the system.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Assess renewable energy resource.

OUTCOME NOTES**OUTCOME RANGE**

Wind and solar.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. Data manuals are correctly identified according to geographical location.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Data is correctly analysed for application.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Adjustments for height(wind data) are correctly carried out.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Data is correctly applied to determine the average available energy.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Written data, records, electronic data.

SPECIFIC OUTCOME 5

Calculate battery bank rating.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. KWhr load value is correctly converted to Ahr value.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Battery losses are taken into account.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The autonomy correction is made based on available data.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 6**

Calculate the solar array and/or wind turbine rating.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Solar array and/or wind turbine rating is correctly calculated as per available resource and load data and manufacturers specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Winter and summer variations are taken into account.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Other factors such as dirt build up and performance deterioration through aging etc are taken into account.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. System losses are included.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 7**

Selected wire sizes correctly.

OUTCOME NOTES**OUTCOME RANGE**

NRS, SABS, etc.

ASSESSMENT CRITERIA**ASSESSMENT CRITERION 1**

1. Specifications in regards to minimum voltage drop is explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Wire size tables are identified and explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Wire sizes are correctly selected as per specifications and standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Knowledge that will help me understand and that I will be able to explain:

- > Safety precautions.
- > Knowledge about conductors and insulation material.
- > The effect of current. (Energy and power)
- > The definition of OHM's law.
- > Knowledge about electromagnetism.
- > Recording and reporting of defects in equipment and tools.
- > Operation of renewable energy system components
- > Alternating current and direct current circuits.
- > Regulations pertaining to the task (SABS and NRS).

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems during the application and maintaining of electrical safety.

UNIT STANDARD CCFO WORKING

Work effectively with others while applying and maintaining electrical safety.

UNIT STANDARD CCFO ORGANIZING

Organize and manage oneself during the construction of circuits.

UNIT STANDARD CCFO COLLECTING**UNIT STANDARD CCFO COMMUNICATING**

Communicate through reporting.

UNIT STANDARD CCFO SCIENCE

Use science and technology in environmental and personal safety.

UNIT STANDARD CCFO DEMONSTRATING

Demonstrate an understanding of the world as a set of related systems.

UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary Information

Specified Requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > SABS
 - > NRS
 - > OHS Act
 - > Applicable statutory requirements
 - > A glossary of terms about the terminology of Context Specific
 - > User manuals supplied by manufacturers
 - > Single phase and DC electrical systems.
 - > Specifications, agreements, policies and procedures.
-



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

39

Maintain high voltage transformer unit protection

SAQA US ID	UNIT STANDARD TITLE		
113895	Maintain high voltage transformer unit protection		
SGB NAME	ABET BAND	PROVIDER NAME	
SGB Electrical Engineering & Construction	Undefined		
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 4	6
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector

A person credited with this unit standard will be capable of:

Planning, preparing, maintaining and completing post maintenance work on HV transformers.
This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Safety procedures
- > Use and knowledge of electrical test equipment
- > Relevant section of Occupational Health and Safety Act
- > Basic safety procedures relating to tools and solvents
- > Electrical drawings
- > Relevant section of statutory requirements
- > General fault finding principles
- > Dismantling and installation procedures
- > Isolating procedure OHS Act
- > Names and functions of transformer components
- > HV electrical induction awareness

UNIT STANDARD RANGE

Oil Filled type
Dry Type

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan to maintain hv transformers.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Planning is done in conjunction with outage scheduling and or maintenance programmes.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Planning is integrated with other disciplines and associated equipment.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Protection testing, engineering operating and control centres. Switchgear, CT, surge arrestors and auxiliary equipment.

ASSESSMENT CRITERION 3

3. Planning is arranged according to equipment history reports and failure rate.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Planning is arranged according to plant availability and customer requirements and network stability.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Temporary electric supply from alternative sources is considered and identified and made available for use of equipment during maintenance where appropriate.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 2

Prepare to maintain hv transformers.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. HV transformer is effectively isolated and made safe to work on in accordance with statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. HV transformer is identified and required tools, equipment and personal protective equipment are selected and obtained prior to maintenance according to job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Test equipment is selected, inspected and checked for functionality and safety prior to maintenance tasks.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Maintenance task instructions are interpreted and sequence of operations is determined and communicated to work team members.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Appropriate drawings and documentation is obtained and made available prior to commencing maintenance task.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Manufacturers specifications, maintenance and testing procedures.

ASSESSMENT CRITERION 6

6. Cleaning materials and equipment are identified and selected to meet job requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. Work area is checked for hazards and corrective action is taken.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Maintain hv transformers.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Environmental requirements pertaining to hazards during maintenance are identified and appropriate corrective action is taken in accordance with applicable requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

PCB's

ASSESSMENT CRITERION 2

2. Mechanisms are maintained according to manufacturer's maintenance manuals and site specific standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Tap changer/ diverter switch.

ASSESSMENT CRITERION 3

3. HV transformer is inspected using diagnostic techniques to determine faults, defective equipment and components and corrective maintenance is carried out according to maintenance procedure and site specific standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Bucholtz relay, flow switch, pressure relief valves, all insulators and breathing apparatus.

ASSESSMENT CRITERION 4

4. Tests are carried out on insulating medium to determine internal faults and corrective action is taken in line with site requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Insulating medium's dielectric strength tests comply to manufacturers specifications and site specific standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Specific standard dielectric test report.

ASSESSMENT CRITERION 6

6. HV transformer and auxiliary equipment/components are effectively cleaned using correct site approved cleaning material and methods.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. Personal protective equipment is used and site specific safety standards are adhered to throughout maintenance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete work task.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Re-commissioning quality checks and tests are conducted after maintenance and necessary adjustments are carried out to meet manufacturer's and work site standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. All reports and documentation are completed and submitted to the designated personnel.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Test reports and function test results.

ASSESSMENT CRITERION 3

3. Transformer is restored to serviceable condition in line with manufacturer's specifications and applicable requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Work task cleaning process is completed according to industry safety standards, environmental requirements and site standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Tools and test equipment is cleaned and returned for safe keeping according to site specific requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Disposal of defective equipment and components and waste materials is carried out in accordance with environmental and work site standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Terminology associated with testing equipment and materials
- > Operating principles of testing equipment
- > Relevant sections of statutory requirements
- > General testing principles
- > Working principles of applicable equipment and components

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems.

UNIT STANDARD CCFO WORKING

Work effectively with others as a member of a team or group.

UNIT STANDARD CCFO ORGANIZING**UNIT STANDARD CCFO COLLECTING****UNIT STANDARD CCFO COMMUNICATING**

Communicate effectively by means of language skills, oral and/or written.

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

40

Evaluate a distribution board

SAQA US ID		UNIT STANDARD TITLE	
113896		Evaluate a distribution board	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL
PPC-EIC-0-SGB ECC		Regular	Level 4
			CREDITS
			10
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons active with design, construction, testing and commissioning of single and three phase distribution boards below 10 KA short circuit capacity in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector

A person credited with this unit standard will be able to:

- > Verify new and modified single and three phase Distribution Board below 10 KA for compliance with the specific requirements of SABS 0142-1 and any associated standards
- > Understand the general concepts of short circuit capacity and fault levels
- > Interpret the specific requirements of SABS 0142-1 clause 6.6
- > Interpret the specific requirements of SABS 1765 regarding safety
- > Evaluate material modifications to distribution boards against the general requirements of SABS 0142-1 and any other nominated code
- > Recognise defects and non compliance and submit reports detailing the extent of the non compliance
- > Issue test and clearance reports and certificates

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Understand the concepts of building and assembling distribution boards to comply with the statutory requirements
- > Understand the components and installation requirements for distribution boards and be able wire and commission the associated components
- > Thorough knowledge of the SABS 0142-1 and the specific requirements of clause 6.6
- > Awareness of any non-compliance to the statutory requirements
- > One year experience in construction and testing of low voltage distribution boards

UNIT STANDARD RANGE

- > Statutory requirements may include but are not limited to Occupational Health and Safety Act and regulations, SABS and I E C codes of practice and standards, specifically SABS 1765, The Mineral and Energy

Act and regulations and manufacturers specifications

- > Understand the design, functional and safety concepts of all types of single and three phase low voltage distribution boards below 10 kA short-circuit capacity, including all the internal component assemblies, wiring systems and specifically the bus bar system and steel construction requirements
- > Understand the principles of manufacture, inspection, test and quality measuring systems such as the ISO 9000 quality system, including inspection and test schedules, reports any other such document required to prove compliance to all the statutory requirements
- > Verify the selection and installation of electrical protection devices suitable for the distribution board function: requirements for compliance with the electrical circuit and environmental conditions
- > Be able to conduct an on site evaluation of any modifications to an existing installation for compliance to the statutory requirements
- > Test equipment may include but are not limited to specific electrical test equipment such as multimeters, insulation tester, clip on ammeter, impedance testing equipment, earth leakage testing devices, earth electrode resistance testing equipment, continuity testers, phase rotation testing equipment and any mechanical measuring devices required to verify compliance to the required code and safety standards

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan the evaluation of a distribution board including new and on site modifications.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Collect all the manufacturing inspection and test schedules for the distribution board type.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. Collect any engineering and layout drawings pertaining to the design and construction of the distribution board.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. Have available all the statutory and manufacturing codes pertaining to the design of the distribution board, such as, but not limited to, SABS 0142-1, SABS 1765, the manufacturers acceptance criteria.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 4

4. Information is collected regarding design, configuration and physical characteristics of the distribution board.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Appropriate tools, equipment and instruments are identified and selected to meet the requirements of the task according to statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Acquire the correct inspection and test documentation necessary to complete the task.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Evaluate a drawing and test reports.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Obtain information on the type, design, construction, layout and functional requirements of the distribution board under evaluation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Engineering drawings are scrutinised and interpreted correctly.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Interpretation of the manufactures specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 4

4. Compare the findings of the evaluation to the specific statutory requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Evaluate the design and construction of distribution boards.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Inspect the bus bar support design and material properties for compliance to the required standard.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Verify the cross section of bus bars and connections are suitable for the design parameters.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Verify that the protection devices are the correct with regard to type and short-circuit rating.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Verify the length of the fault free zone and that all components installed are suitable.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Verify that the maximum distance between the terminals and the first support comply with the standard.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 6

6. Compare the power and distribution loss of the of components to the standard specifications in the standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. Verify that the requirements for air circulation and heat dissipation are complied with.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 8**

8. Examine all areas that could be effected by eddy current losses.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 9**

9. Verify that the current density of all the fitted bus bars comply to the standard, SABS 0142-1 or any type testing allowances.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 10**

10. Ensure that the conductors and connecting devices are of the correct size and that any grouping factors have been taken into account.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 11**

11. Verify that there is sufficient free space around the functional units.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Evaluate the mechanical operational aspects.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Establish the general strength of the assembly complies with the SABS 1765 requirements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Verify that the construction and fastening of the doors and panel covers comply with the requirements of the code and standard.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Verify that when an assembly is extended all the requirements of the standard are complied to with reference to electrical and mechanical integrity.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Assembly installations and any adverse environmental conditions.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Purpose of creepage and clearances measurements.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Earthing systems for the assemblies.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 5**

Duties of a distribution evaluator.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Obtain information regarding the manufacturer and date of installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Have available engineering design drawings and any other written specifications for verification of the as built assembly.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Determine and record any deviations from the original design.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Evaluation of the results in terms of SABS 0142-1 clause 6.6.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Compile the test and inspection report to be submitted to the accredited person.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Demonstrate the ability to compile satisfactory reports and complete recognised test reports.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 6**

Occupational health and Safety Act 85 of 1993 and electrical regulations.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Understand the distribution boards requirements SABS 0142-1 to clause 6.6.1, 6.6.2, 6.6.3, 6.6.4.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Proof that all installed components comply with the statutory regulations.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Compliance with the general requirements of over voltage protection devices included in the design and construction of the distribution board.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Demonstrate the ability to evaluate exiting distribution boards and constructed assemblies.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Responsibility of distribution boards evaluators.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Compiling the routine test report for accuracy and completeness.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. Interrelationship of factory and routine testing and issuing of test reports and certificate of compliance

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a

provider through the relevant ETQA by SAQA.

3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

4. To be determined by ETQA in consultation with NSB.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Specific requirements of SABS 0142 - 1
- > Calculate prospect short circuit current
- > SABS 1765 Safety specifications for distribution boards below 10 kA? Occupational Health & Safety Act (Act 85 of 1993) and regulations
- > SABS 0142-1
- > Knowledge about type two co-ordination
- > Duties of a distribution evaluator
- > ISO quality management systems
- > Authorised marks of approval and authorisation
- > Certificate of Compliance

Knowledge that will help me understand and that I will be able to explain:

- > Types of R C C compliant or SABS certified materials and components
- > Interpretation of the relevant requirements of SABS 0142-1
- > Fault finding techniques
- > Importance of safety for the authorized operating and maintenance personnel
- > The importance of accurately recording data and test results
- > Approved SABS codes relating to electrical equipment
- > The extent of consequential losses in case of a failure of the assembly

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identify and solve problems (identification of defects and deficiencies) and propose cost effective solutions

UNIT STANDARD CCFO WORKING

Work effectively with others (during the testing and inspection of an assembly)

UNIT STANDARD CCFO ORGANIZING

Organise and manage oneself (identification and selection of appropriate documentation and electrical test equipment)

UNIT STANDARD CCFO COLLECTING

Collect, analyse, organise and critically evaluate information (during the inspection and testing of the installation)

Compile a findings report

UNIT STANDARD CCFO COMMUNICATING

UNIT STANDARD CCFO SCIENCE

UNIT STANDARD CCFO DEMONSTRATING

Interpret the respective requirements of SABS 0142-1 clause 6.6

Interpretation on statutory requirements

UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary information:

Specified requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > Applicable statutory requirements
- > User manuals supplied by the manufacturer
- > Training notes for use during inspections
- > Specifications, agreements, policies and procedures
- > Safety and permit to work procedures

Applicable statutory requirements

A glossary of terms about the terminology of

Context specific

User manuals supplied manufacturers

() system

Specifications, agreements and policies and procedures



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

41

Troubleshoot on programmable logic controllers

SAQA US ID		UNIT STANDARD TITLE	
113897		Troubleshoot on programmable logic controllers	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL
PPC-EIC-0-SGB ECC		Regular	Level 4
			CREDITS
			5
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the electrical engineering and maintenance environment.

A person credited with this unit standard will be able to:

- Understand the principle of operation of a PLC,
- Understand the operation and purpose of basic instructions of a PLC
- Understand and applying the principles of uploading and downloading software programs, and testing and evaluating operating parameters.
- Demonstrate and understand programmable process communication systems.
- Doing basic troubleshooting using circuit diagrams and indicator lights on the PLC system.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Numbering systems and logic functions.
- > Interpretation of electrical drawings and circuit diagrams.
- > Apply and maintain electrical safety.
- > Relevant sections of statutory requirements.
- > Worksite standards and procedures.
- > Basic computer literacy.
- > ABET Level 4 communication.
- > Select, use and care for electrical instruments.

UNIT STANDARD RANGE

- > The PLC system used is limited to a minimum size of 8 I/O and a maximum of 32 I/O
- > Programming languages appropriate to the PLC used include but not limited to:

- a. Ladderb.
- b. STLC.
- c. SFC

> Type of PLC's used include but is not limited to:

- a. Block PLC's,
- b. Modular PLC's,
- c. Screw mounted PLC's,
- d. Din rail PLC's.

> Statutory requirements are included but are not limited to SABS 0142, OSH Act.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan and prepare for.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. All relevant documentation is obtained according to worksite procedures.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

Drawings, Control Program, Worksite Procedures, Indicator statuses

ASSESSMENT CRITERION 2

2. The necessary equipment is selected according to worksite procedures.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

Measuring/monitoring equipment.

ASSESSMENT CRITERION 3

3. Worksite is inspected for safe working conditions and corrective action is taken where required.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

No open-ended wires, and energy sources are isolated.

ASSESSMENT CRITERION 4

4. Personal protective equipment is selected as per OSH act and worksite procedures/regulations.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 5

5. Obtain the operating principle of the process/equipment to be controlled with the PLC.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Demonstrate an understanding of Programmable Logic Controllers.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. A good understanding of generic PLC theory is shown.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

All system components and their operation, wiring of I/O modules & troubleshooting with their status indicators.

ASSESSMENT CRITERION 2

2. A good understanding of the operating principle of the back plane and power supply.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

A parallel bus or network bus. Operation of redundant/Non-redundant power supplies.

ASSESSMENT CRITERION 3

3. A good understanding of the memory area of the processor is shown.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

The program memory with the use of main routines and sub-routines. The Input and output image tables with an understanding of a "conducting" normally open contact as an equivalent for a logic 1 and a "conducting" normally closed contacts as an equivalent for a logic 0.

ASSESSMENT CRITERION 4

4. A good understanding of the functioning of the basic instructions in a PLC system is shown.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Input, output, latch/set, unlatch/reset, timers and counter instructions.

SPECIFIC OUTCOME 3

Demonstrate an understanding of programmable process communication.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Opening the programming software is demonstrated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Computer based systems, or industrial programmers.

ASSESSMENT CRITERION 2

2. The set-up of process communication drivers between programming device and controller is understood and demonstrated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

Serial communications, standard network communications or propriety communications.

ASSESSMENT CRITERION 3

3. The processor with the desired program is identified.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Going online with a program that already exist in a controller or downloading a program to a controller with no/incorrect/outdated program, is demonstrated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Doing basic troubleshooting using software and PLC indicator lights.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The symptoms of the fault are recorded.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. The symptoms are analyzed using indicators on the PLC system and monitoring programming software.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The possible fault is identified.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Safety, good housekeeping and environmental practices are followed before, during and after performance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Completion of job is reported.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as a assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > A comprehensive understanding of the relevant legislation, licensing requirements and procedures and practices.
- > A broad understanding of
- > A comprehensive understanding of
- > A basic understanding of

Knowledge that will help me understand and that I will be able to explain:

- > Terminology associated with PLC's and components
- > Working principles associated with PLC's and its components.
- > Interpretation of manufacturer's data sheets.
- > Identification of relevant equipment.
- > Basic PLC instructions.
- > Translation of specification into a control program for the PLC.
- > Interpretation of a control program in a PLC.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems in which responses display that responsible decisions using critical and creative thinking have been made.

UNIT STANDARD CCFO WORKING

Work effectively with others as a member of a team, group, organization, and community.

UNIT STANDARD CCFO ORGANIZING

Organize and manage oneself and one's activities responsibly and effectively.

UNIT STANDARD CCFO COLLECTING

Collect, analyze, organize and critically evaluate information.

UNIT STANDARD CCFO COMMUNICATING

Communicate effectively using visual, mathematical and/or language skills in the modes of oral and/or written persuasion.

UNIT STANDARD CCFO SCIENCE

Use science and technology effectively and critically, showing responsibility towards the environment and health of others.

UNIT STANDARD CCFO DEMONSTRATING

Understand the world as a set of related systems by recognizing that problem solving contexts do not exist in isolation.

UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary information:

Specified Requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > NZ 2395
- > OSHA Act



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

42

Issue certificate of compliance for a single phase domestic installation

SAQA US ID		UNIT STANDARD TITLE	
113898		Issue certificate of compliance for a single phase domestic installation	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL
PPC-EIC-0-SGB ECC		Regular	Level 4
			CREDITS
			5
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Electrical Engineering; Generation; Distribution; Transmission, Construction and Renewable Energy Sector

A person credited with this unit standard will be capable of:

- > Obtaining the completed inspection and test results of a single phase domestic electrical installation and be aware of any defects.
- > Using inspection documents obtained from the inspection and test and be able to use this information for completing the Certificate of Compliance.
- > Complete the written portion of the Certificate of Compliance with correct and accurate information.

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment. This unit standard is a pre requisite for registration as an accredited person and does not give learners the legal right to issue a Certificate of Compliance. The registering authority will do registration as an accredited person. This unit standard may not cover the Explosion Industry.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Testing and inspection of single phase domestic installations
- > Wire and commission single phase domestic electrical circuits
- > Assessed working knowledge of: SABS 0142-1
- > Awareness of the statutory requirements for non-compliance to the Occupational Health & Safety Act (Act 85 of 1993)

UNIT STANDARD RANGE

- > Statutory Requirements may include, but are not limited to the Occupational Health and Safety Act 85 of 1993, SABS codes, Mineral and energy Act, Local Authority requirements, Manufacturers specifications and Worksite procedure
- > Domestic installations may include but are not limited to houses, flats and townhouse complexes and such, where the supply to the premises is single phase in both rural and urban environments
- > Test equipment may include but are not limited to multimeters, insulation tester, clip on ammeter, impedance

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testing equipment, earth leakage testing devices, earth electrode resistance testing equipment, continuity testers

> The Certificate of Compliance refers to a specific statutory document contained in the SABS 0142-1 code of practice

> The ability to review and interpret an existing Certificate of Compliance for accuracy of the recorded information and compliance with the code

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan to complete the certificate of compliance from all the inspection and test data.

OUTCOME NOTES

OUTCOME RANGE

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Collate all the inspection and test data and relevant information of the installation.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 2

2. Obtain the Certificate of Compliance form in the correct format.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 3

3. Transfer all the necessary data to the appropriate parts of the Certificate of Compliance.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

ASSESSMENT CRITERION 4

4. Identify any noted defects from the collated data or code contraventions and report them to the user or owner of the installation.

ASSESSMENT CRITERION NOTES

ASSESSMENT CRITERION RANGE

SPECIFIC OUTCOME 2

Review of all the information on an existing certificate of compliance.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Scrutinise the recorded information for any abnormal or incorrect entries.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Evaluate the statements recorded for compliance with the code.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Test the recorded data against the code requirements, available drawings, circuit diagrams and any other relevant information regarding the installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Record any defects.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. The values of readings from test is analysed for compliance with the code.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Review of a certificate of compliance against a specific installation.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. Scrutinise the recorded information for any abnormal or incorrect entries.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Compare the recorded entries related to the features of the installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Verify the recorded information against the relevant sections of the code.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Record all defects and the specific code contravention.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Report to the user the non-compliant sections of the installation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Complete a valid certificate of compliance by signing off the relevant sections of certificate.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Transfer all the required information onto the certificate of compliance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. Keep a record of all the information on the contained on the certificate of compliance.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Relevant parties informed of outcome of verification.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Job completion is reported to your supervisor and issue the completed certificate of compliance to the user or owner.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Assessed working knowledge of SABS 0142-1 (Latest edition) and the Occupational Health & Safety Act (Act 85 of 1993)
- > Inspection documents and check lists pertaining to a single phase installation including the contents of a Certificate of Compliance
- > Understand the concepts of a single phase installation and its environment

Knowledge that will help me understand and that I will be able to explain:

- > Types of material/equipment that may be used in electrical installations
- > Fault tracing procedures
- > Importance of safety for the user of the installation
- > The importance of accurately recording data and test results
- > Approved/SABS code relating to electrical equipment

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identify and solve problems (identification of defects)

UNIT STANDARD CCFO WORKING

Work effectively with others (during the testing and inspection of an installation)

UNIT STANDARD CCFO ORGANIZING

Organise and manage oneself (identification and selection of electrical equipment in the installation)

UNIT STANDARD CCFO COLLECTING

Collect, analyse, organise and critically evaluate information (during the inspection and testing of the installation)

UNIT STANDARD CCFO COMMUNICATING

Communicate (reporting of defects)

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING**

Interpretation on statutory requirements

UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

Supplementary information:

Specified requirements

Specified requirements include legal and legislative specific requirements and are contained in one or more of the following documents:

- > SABS codes of practice for electrical installations
- > Occupational Health & Safety Act (Act 85 of 1993)

Applicable statutory requirements

A glossary of terms about the terminology of

Context specific

User manuals supplied manufacturers

() system

Specifications, agreements and policies and procedures



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

43

Operate on Medium Voltage radial networks

SAQA US ID	UNIT STANDARD TITLE		
113900	Operate on Medium Voltage radial networks		
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
PPC-EIC-0-SGB ECC	Regular	Level 4	20
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Medium Voltage reticulation environment.

The person credited with this unit standard is capable of carrying out operating on Medium Voltage radial networks by doing:

- > Switching of apparatus
- > Linking of apparatus
- > Safety testing and earthing of apparatus
- > Prepare apparatus for safe / working conditions [where applicable]
- > Returning apparatus to service

This unit standard will contribute to the full development of the learner within the electrical engineering and construction environment by providing recognition, further mobility and transportability within the field of Physical Planning and Construction. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the electrical engineering and construction environment.

LEARNING ASSUMED TO BE IN PLACE

- > Apply safety in the electrical environment
- > Introduction to industry
- > Operating regulations for High Voltage systems (extensions of the OHS Act)
- > Read and interpret Medium Voltage network diagrams
- > Low / Medium Voltage test instruments
- > Handling and caring of electrical earthing gear and related equipment
- > Names and functions of Medium Voltage apparatus found on electrical reticulation networks

UNIT STANDARD RANGE

- > Operating is limited to Medium Voltage radial feeders to include switching, linking, safety testing, earthing, and preparation for work.
- > Operating conditions include normal / abnormal, planned / unplanned and day / night.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Plan and prepare to operate on Medium Voltage radial networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Determine the scope of work to be carried as per work request.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The affected customers are notified of the outage details.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Plan the sequence of events in conjunction with Work Coordinator / Control and with work teams where applicable.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Ensure that the relevant earthing gear, insulated operating rods / sticks, applicable testing devices and keys are available and serviceable.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. Visible Inspection is carried out on the apparatus to be operated on to ensure that it is in a good serviceable condition as per manufacturer's specifications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 2

Switch apparatus on Medium Voltage radial networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Operating instructions are received, written clearly / legibly and confirmed with relevant control centre as per operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The appropriate apparatus control panel is identified and checked for irregularities and correct safety labels / signs attached as per the statutory requirements and operating standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The appropriate supervisory / remote control devices are rendered inoperative as per operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The appropriate breakers / switches are identified, operated and status verified / reported where necessary as per instruction.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Link / isolate apparatus on Medium Voltage radial networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA**

ASSESSMENT CRITERION 1

1. The appropriate isolators are identified and checked for irregularities and correct safety labels / signs attached as per operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Written operating instructions are taken to the isolator for verification prior to carrying out linking operation.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. The appropriate isolators are unlocked, opened / closed, locked again, link inserts removed where applicable and status verified as per operating instruction.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The status of the isolators reported where necessary as per operating instruction.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 4**

Safety test and earth apparatus on Medium Voltage radial networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The safety testing device is selected, inspected and checked for functionality prior to earthing being carried out as per operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 2

2. Written operating instructions are taken to apparatus, physical isolator / link, to verify status and carry out the safety testing operation as per operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Earth gear and insulated operating rods / sticks are correctly selected and inspected to be in good condition as per operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The earthing gear is adequately applied to the apparatus / circuit as per the operating instructions / procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 5**

Restore supply to Medium Voltage radial networks.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Ensure that all equipment has been removed from the work site and all workers have been informed that the apparatus will be returned to service.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Operating instructions are received, written clearly / legibly and confirmed with relevant control centre as per operating procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. All earthing gear is removed from the apparatus / circuit as per the operating instructions / procedures

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. The appropriate isolators are unlocked, opened / closed, locked again, link inserts replaced where applicable and status verified as per operating instruction.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 5**

5. The appropriate breakers / switches are identified, operated and status verified / reported where necessary as per instruction.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 6**

6. Warning labels / signs are removed and access gates / doors locked as per local standards.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 7**

7. Written operating instructions is verified, reported back to the controller and operating instructions confirmed.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

1. Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
2. Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
3. Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

1. A comprehensive understanding of operating principles and terminology.
2. Able to read, report and interpret operating instructions from / to control.
3. Able to use a range of operating equipment and testers.
4. Ability to read and relate to operating diagrams.
5. A basic understanding of related safety standards and procedures.
6. A comprehensive understanding of how to physically operate the different types of apparatus.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING****UNIT STANDARD CCFO WORKING****UNIT STANDARD CCFO ORGANIZING**

Organise oneself and one's activities responsibly and effectively, with the ability to follow instructions when working independently or in a work team to ensure safe execution of work activities.

UNIT STANDARD CCFO COLLECTING

Collect, evaluate, organise and critically evaluate information related to (operating of apparatus on medium voltage radial networks).

UNIT STANDARD CCFO COMMUNICATING

Effective use of communication methods when giving / receiving instructions, following / carrying of instruction: and recording / reporting information.

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING**

Responsible thinking and decision making with regard to safety precautions and procedures during operating process to be applied at all times.

UNIT STANDARD CCFO CONTRIBUTING**UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTES

- > This unit standard can be assessed in a workplace environment, or in a training or educational environment if simulated equipment response and examples are able to be provided, or in a combination of both environment
- > Performance in relation to the elements must comply with current legislation, especially the OSH Act and their subsequent amendments, electricity supply industry codes of practice and documented procedures. A full list of current legislation and industry codes is available from the SETA.
- > Reference to terms, procedures, and specifications in this unit standard may be taken as including documented procedures and specifications relevant to the workplace in which assessment is carried out.
- > Performance in relation to the elements must comply with Industry operating regulations for high voltage systems [ORHVS] being extensions of the OHS Act. Also industry operating standards.
- > All work practices shall meet documented industry maintenance standards, including the quality management requirements, and the documentation of activities, events, and decisions.

Specified Requirements**Legal Requirements:**

- > OHS Act
- > Operating regulations for high voltage systems
- > Local or Industry Authority regulations



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

44

Demonstrate an understanding of process communication systems

SAQA US ID		UNIT STANDARD TITLE	
113901		Demonstrate an understanding of process communication systems	
SGB NAME		ABET BAND	PROVIDER NAME
SGB Electrical Engineering & Construction		Undefined	
FIELD DESCRIPTION		SUBFIELD DESCRIPTION	
Physical Planning and Construction		Electrical Infrastructure Construction	
UNIT STANDARD CODE		UNIT STANDARD TYPE	NQF LEVEL
PPC-EIC-0-SGB ECC		Regular	Level 4
			CREDITS
			8
REGISTRATION START DATE	REGISTRATION END DATE	REGISTRATION NUMBER	SAQA DECISION NUMBER

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

- > Demonstrate an understanding of process communication systems.

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

- > Safety procedures according to statutory and manufacturer requirements
- > Induction to industry
- > Basic computer literacy
- > Basic understanding of electricity
- > Basic digital electronics
- > Basic programmable logic controllers

UNIT STANDARD RANGE

- > Type of media used includes but is not limited to: copper cables, optic cables, microwave, radio, infrared and power line.
- > The range of cables includes but is not limited to: open wire pairs, twisted pairs, unshielded twisted pairs, co-axial, bundled, individual, mono mode step index, multimode, wave guides.
- > The networks used include but are not limited to: modbus, profibus, foundation fieldbus, RS485, devicenet, CAN bus, data highway plus, remote IO, controlnet, ethernet, ASI bus.
- > Safety precautions include the use of personal protective equipment, electrical and fire protection, process isolation.
- > Statutory requirements include but are not limited to SABS, OSH Act and manufacturers specifications.

UNIT STANDARD OUTCOME HEADER

N/A

Specific Outcomes and Assessment Criteria:**SPECIFIC OUTCOME 1**

Demonstrate an understanding of the hierarchical industrial network structure.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The different levels of control are identified and explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The different industrial networks for each control level are identified.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Hazards associated with the use of are recognised and necessary precautions taken according to work site procedures.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 2**

Demonstrate an understanding of the use of a network in conjunction with a control system.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The condition of the network is explained by using status indicators.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Cable continuity is correctly measured.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

ASSESSMENT CRITERION 3

3. Correct use of terminators is demonstrated.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Transceivers or conversion devices are identified and correctly utilised.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****SPECIFIC OUTCOME 3**

Demonstrate an understanding of network addressing.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. Correct use of appropriate addressing is used to establish communications with specific equipment.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. The method of addressing is explained with the use of plant/equipment drawings.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Faults are correctly diagnosed by utilising the indicator lights.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Communication status indicators are correctly identified and the status correctly explained.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE**

SPECIFIC OUTCOME 4

Demonstrate an understanding of connecting a programming terminal to a processor via a network.

OUTCOME NOTES**OUTCOME RANGE****ASSESSMENT CRITERIA****ASSESSMENT CRITERION 1**

1. The appropriate connector and cable is selected for the network.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 2**

2. Correct address are selected to establish communications.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 3**

3. Communications is established.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****ASSESSMENT CRITERION 4**

4. Control program is monitored from the remote terminal.

ASSESSMENT CRITERION NOTES**ASSESSMENT CRITERION RANGE****UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**

- > Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
- > Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.
- > Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- > Workshop procedures including house keeping practices according to statutory requirements.
- > Specific work site safety practices relating to the use of power tools including the use of personal protective equipment, electrical and fire protection.
- > Names, locations and functions of pressure equipment and their accessories.
- > Hazards and preventive precautions associated with pressure equipment.
- > Company quality standards.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):**UNIT STANDARD CCFO IDENTIFYING**

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO ORGANIZING**UNIT STANDARD CCFO COLLECTING****UNIT STANDARD CCFO COMMUNICATING**

Communication skills - reporting faulty pressure equipment and interpreting job requirements.

UNIT STANDARD CCFO SCIENCE**UNIT STANDARD CCFO DEMONSTRATING****UNIT STANDARD CCFO CONTRIBUTING****UNIT STANDARD ASSESSOR CRITERIA**

N/A

UNIT STANDARD NOTESN/A
