Quality Council for Trades & Occupations
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OCCUPATIONAL SKILLS PROGRAMME DOCUMENT

IN LINE WITH OQSF POLICY (2021) OCCUPATIONAL QUALIFICATION TYPE (NOMENCLATURE)

SKILLS PROGRAMME	SKILLS PROGRAMMES ID	TITLE (DESCRIPTOR)	NQF LEVEL	CREDITS
	SP-250305	Solar Photovoltaic (PV) Installation Tester	5	60

START DATE	END DATE	LAST DATE FOR ENROLMENT	LAST DATE FOR ACHIEVEMENT
27 Mar 2025	27 Mar 2030	27 Mar 2031	27 Mar 2034

CURRICULUM CODE	900279-000-00-00

PARTNER DETAILS	ORGANISATION NAME	WEBSITE ADDRESS	TELEPHONE NUMBER	LOGO
QUALITY PARTNER - DEVELOPMENT	EWSETA	www.ewseta.org.za	011 274 4700	EW SETA

Contents

1. SKILLS PROGRAMME DETAILS

1.1 Sub-Framework: Occupational Qualifications Sub-Framework

Occupational Qualification Sub Framework (OQSF)

1.2 Type (Nomenclature):

1.2.1 Specify if this is a Qualification/Part-Qualification/Skills Programme

Skills Programme

1.2.2 Type: (Nomenclature) e.g. Advanced Occupational Certificate)

Skills Programme

1.3 Title Descriptor:

State the Occupation, Specialisation, context or Skills Programme context

Solar Photovoltaic Installation Tester

1.4 NQF Level:

NQF Level 5

1.5 Credits:

59

1.6. Organising Field and Sub-field:

1.6.1 Organising Field:

Field 006: Manufacturing, Engineering and Technology

1.6.2 Organising Sub-Field:

Engineering and Related Design

1.7 QCTO Curriculum Code:

900279-000-00-00

1.8 Originator/Quality Partner (QP) – Development/Assessment

1.8.1 Quality Partner (Qualifications Development):
EWSETA

1.8.2 Quality Partner (Assessment):
N/A

1.9 Replacement

For the Replacement of Registered Occupational/Historical Qualifications/Unit Standards (US) and/or Learning Programmes (LP)/ QCTO/SETA Approved Skills Programmes, list details below:

This qualification replaces:

SAQA QUAL/US/LP ID OR QCTO/SETA APPROVAL ID	QUALIFICATION TITLE	Pre-2009 NQF Level	NQF LEVEL	MIN. CREDITS
N/A	N/A	N/A	N/A	N/A

2. RATIONALE

2.1 The need for the Skills Programmes

As the demand for renewable energy continues to increase, employers in the public and private renewable energy industry are looking to recruit and employ competent individuals to test and maintain solar photovoltaic systems. This skills programme is intended to meet the need of the industry to provide learners with knowledge and skills to operate as Solar PV Testers. Qualifying learners will know the functioning and operating requirements for using appropriate equipment, tools and test instruments to test and determine functionality of the installed Solar PV system, understand and resolve problems/faults identified under supervision.

2.2 Benefit to the sector, society and the economy:

The energy sector faces high demand for electricity supply to millions of people due to population growth, and many companies including government entities allow their employees to work in homes and business facilities which have Solar PV systems installed. The solar PV systems installed, which in some cases, may have specific and unique hazards and risks when maintaining them as they operate at very high DC

voltage at high currents with dual AC supplies into the electrical distribution system and cannot be switched off or isolated by the users.

This skills programme will provide learners with requisite competencies (knowledge, skills, attributes and attitudes) needed to test, identify and troubleshoot faults and/or replace components of the installed Solar PV systems safely and systematically as well as checking the efficiency of the PV systems and ensure maximum output of system performance of its capabilities for maximum Return-on-Investment (RoI) for organisations.

In addition, solar PV systems that are installed must be tested to meet legislative and regulatory compliance requirements which offer substantial benefits to the economy, society, including cost savings to the industries, commercial, farms and residential settings, and contributes to job creation to address poverty. The benefit to Renewable Energy sector is to address inequalities and to grow the economy, by enabling community reskilling and upliftment of an individual or society providing individuals with employable skills.

The skills, knowledge and understanding demonstrated within this skills program are essential for social and economic transformation and upliftment within the Renewable Energy, Electrical Engineering and Construction environments.

2.3 Similar Qualification(s), Part-Qualifications/Skills Programmes

- Higher Occupational Certificate: Solar Photovoltaic Standalone Service Technician, NQF Level 5, (SAQA ID *120863)*
- National Occupational Certificate: Solar Photovoltaic Standalone Systems Installer, NQF Level 4, Credits (SAQA ID *120883)*
- National Occupational Certificate: Solar Photovoltaic Standalone System Mounter, NQF Level 5 (SAQA ID *120885)*

2.4 Typical learners:

- New entrants

- Those already working in the sector without formal recognition of their training
- Unemployed

2.5 Relation to Occupation(s) and/or Profession(s)

2.5.1 Occupation(s) related:

2.5.1.1 Collaboration with relevant stakeholders:

Stakeholders which participated include:

- Skills Development Providers (both public and private)
- Employers and employer organisations
- Higher Education Institution
- Curriculum/Assessment Expert

2.5.1.2 List typical occupations in which the qualifying learner will operate (if relevant)

Individuals who have been found competent against this skills programme as may be able to work in a variety of occupations, including:

- Solar Photovoltaic Tester

2.5.2 Profession(s) related:

2.5.2.1 Collaboration with relevant stakeholders:

N/A

2.5.2.2 List typical professions in which the qualifying learner will operate (if relevant)

N/A

3. PURPOSE

3.1 Benefit the learners:

The main aim of this skill programme is to equip learners with knowledge and skills for performance testing and installation of standard photovoltaic systems and

components. Learners will acquire knowledge and practical skills to perform standard tests on photovoltaic systems, performing regular maintenance, diagnose and troubleshoots fault to ensure continual performance of the installed solar photovoltaic system according to safety regulations and manufacturer's instructions is fully functional.

Qualified learners will be able to understand the working principles of photovoltaic systems, different types of photovoltaic components and materials, the design and configuration of photovoltaic systems as well as installation standards and regulations. Participants should be capable of performing system testing and performance evaluation under supervision, maintenance and troubleshooting, and have a comprehensive understanding of the importance of renewable energy and sustainable development, as well as the prospects of the industry and the importance of technological innovation.

3.2 What the qualification or part-qualification intends to achieve:

The purpose of this skills programme is to prepare a learner to operate as a Solar Photovoltaic (PV) Installation Tester.

A Solar PV Installation Tester conducts electrical inspection of an industrial/commercial/residential solar photovoltaic installations, maintains, safely tests all aspects of PV system under supervision, diagnoses, conducts system performance evaluations, identifies, troubleshoots and records faults, maintains the PV system for optimal performance in accordance with the applicable statutory requirements, safety protocols, and standards operating procedures.

A qualified learner will be able to:

- Conduct inspections and evaluate the functionality of the installed PV System
- Maintain, test and replace inverters and transformers
- Maintain, test and replace cables, cable inter-connections, smart boxes, Solar PV junction/string boxes, string diodes, connectors, fuses, switchgears and control gears and repair switchgears and control gears

- Maintain, test and replace batteries and charge controllers.
- Maintain accurate records and compile a maintenance and testing report

3.3 Typical Graduate attributes

- Analytical and critical thinking
- Problem solving
- Attention to details
- Teamwork spirit
- Professionalism and responsibility

4. ENTRY REQUIREMENTS

- NQF Level 4 qualification with Mathematics

5. RECOGNITION OF PRIOR LEARNING (RPL):

5.1 RPL for Access to Training:

Learners may use the RPL process to gain access to training opportunities for a programme of learning, qualification, part-qualification, or skills programme if they do not meet the formal, minimum entry requirements for admission. RPL assessment provides an alternative access route into a programme of learning, qualification, part-qualification, or skills programme.

Such an RPL assessment may be developed, moderated, and conducted by the accredited Skills Development Provider which offers that specific qualification/part qualification/skills programme. Such an assessment must ensure that the learner is able to display the equivalent level of competencies required for access, based on the NQF level descriptors.

For exemption from modules through RPL, learners who have gained the stipulated competencies of the modules of a programme of learning, qualification, part-qualification, or skills programme through any means of formal, informal, or non-formal

learning and/or work experience, may be awarded credits towards relevant modules, and gaps identified for training, which is then concluded.

5.2 RPL for Access to the External Integrated Summative Assessment (EISA):

Learners who have gained the stipulated competencies of the modules of a programme of learning, qualification, part-qualification, or skills programme through any means of formal, informal, or non-formal learning and/or work experience, may be awarded credits towards relevant modules, and gaps identified for training, which is then concluded.

For a Skills Programme, the accredited Skills Development Provider (SDP) must ensure all modular competency requirements are met prior to the FISA and keep record of such evidence.

Upon successful completion of the FISA, RPL learners will be competent against this skills programme. Quality Partners are responsible for ensuring the RPL mechanism and process for qualifications and part-qualification is approved by the QCTO.

6. RULES OF COMBINATION

6.1 Components:

KNOWLEDGE/THEORY COMPONENT

State compulsory modules:

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
900279-000-00-KM-01	Basic Communication Theory	3	3	Blended
313109-002-00-KM-05	Maintenance, troubleshooting, fault-finding and repairs to PV systems 3	5	13	Blended
111204-003-00-KM-07	Record-Keeping and Registry Administration Principles and Processes	5	2	Blended

313109-001-00-KM-08	Components of PV systems 2	5	20	Blended
111204-003-00-KM-11	Professional Skills and Personal Development	5	3	Blended

Total credits of the selected modules = 41

APPLICATION COMPONENT

PRACTICAL SKILLS MODULE(S)

State compulsory modules:

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
313109-002-00-PM-02	Maintain, test, diagnose, repair, and replace inverters in PV systems	5	4	Face-to-Face
313109-002-00-PM-03	Use tools, measuring instruments and equipment	4	7	Face-to-Face
313109-002-00-PM-04	Maintain, test, diagnose and replace batteries in PV systems	5	4	Face-to-Face
313109-002-00-PM-05	Maintain, test, diagnose and replace cables, cable inter-connections, smart boxes, PV junction/string boxes, string diodes, connectors and fuses in PV systems	5	4	Face-to-Face

Total credits =19

WORK EXPERIENCE MODULES

State compulsory modules:

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
N/A	N/A	N/A	N/A	N/A

6.2 Soft Skills Included:

Indicate if 5% -10% of soft skills is included and give location notes on the modules where this is found:

soft skill(s) is/are included in modules:

900279-000-00-KM-01;111204-003-00-KM-11

6.3. Foundational Learning:

N/A

7. EXIT LEVEL OUTCOMES (ELO) AND ASSOCIATED ASSESSMENT CRITERIA (AAC)

7.1 Exit Level Outcomes (ELO) 1:

Perform site evaluations of an installed solar photovoltaic systems through the application of appropriate principles and procedures.

Associated Assessment Criteria (AAC) for ELO 1:

- Solar Photovoltaic specific hazards and risks are identified, analysed and mitigated through planning
- Principles and procedures of working at heights are explained and applied in terms of the occupational health and safety legislative requirements
- Preventative and corrective measures are applied using mitigation plan

7.2 Exit Level Outcomes (ELO) 2:
Apply techniques and procedures to perform electrical testing and inspection on solar photovoltaic system components

Associated Assessment Criteria (AAC) for ELO 2:

- Knowledge of authorisation, lock-out and isolation procedures is demonstrated.
- Safe isolation is performed applying safe working practices.
- Solar Photovoltaic electrical safety inspection is conducted
- Relevant documentation relating to electrical testing such as DC polarity, open-circuit voltage (Voc), short-circuit current (Isc) and insulation resistance testing results is completed for reporting and record-keeping
- Appropriate inspection, testing and troubleshooting techniques are applied based on accurate diagnosis using appropriate tools, modules and equipment.
- Single line diagramme (SLD) is read and interpreted correctly.
- Manufacturer's specifications, safety statutory requirements, and SANS standards are adhered to in all testing operations.

7.3 Exit Level Outcomes (ELO) 3:
Monitor the solar photovoltaic system performance using the applicable principles.

Associated Assessment Criteria (AAC) for ELO 3:

- Factors affecting solar PV performance are identified and assessed to take corrective action for optimal performance
- Inverter faults are checked and maintained to improve performance
- Solar PV Performance verification is conducted based on the irradiance and temperature, amongst others

7.4 Exit Level Outcomes (ELO) 4:

Maintain electrical and mechanical components of a solar photovoltaic system applying suitable methods and techniques.

Associated Assessment Criteria (AAC) for ELO 4:

- Knowledge of authorisation, lock-out, and isolation procedures is demonstrated.
- Appropriate maintenance schedules, diagrams and documentation are used, and maintenance activities are recorded and reported.
- Appropriate inspection, testing and troubleshooting techniques are demonstrated through accurate diagnoses using appropriate tools, modules and equipment.
- Readings and data sheets are interpreted correctly.
- Inverters are removed and replaced on standalone installations and minor inverter components are removed and replaced on solar PV system.
- Transformer earthing is checked.
- Manufacturer's specifications and safety requirements are adhered to in all solar PV testing, fault-finding and troubleshooting operations.

8. INTEGRATED ASSESSMENT

8.1 Formative Assessments conducted internally

Formative assessments are conducted throughout the training of learners. A range of formal, non-formal, and informal ongoing assessment activities are used to focus on teaching and learning outcomes to improve learner attainment.

Formative assessments are conducted continuously by the facilitator to feed into further learning, to identify strengths and weakness, and to ensure the learner's ability to apply knowledge, skills and workplace experience gained.

Formative Assessments are conducted by the accredited Skills Development Provider (SDP), and a variety of ongoing assessment methods may be used, for example, quizzes, assignments, tests, scenarios, roleplays, interviews. Continuous feedback must be provided.

8.2 Integrated Summative Assessments conducted Internally

Integrated Assessment involves all the different types of assessment tasks required for a particular qualification, part-qualification, or occupational skills programme, such as written assessment of theory and practical demonstration of competence. To achieve this, the Internal Assessment Criteria (IAC) for all modules as found in the QCTO curriculum document must be followed. An accredited SDP should implement a well-designed, formal, relevant, final internal Summative Assessment strategy for all modules to prepare learners for the FISA.

These assessments evaluate learning achievements relating to the achievement of each module of the relevant components of the qualification, part-qualification, or skills programme.

Internal Summative Assessments are developed, moderated, and conducted by the SDP at the end of each module or after integration of relevant modules, e.g., communication methods (written, verbal and non-verbal) knowledge tests, practical demonstrations as integrated in the ELOs.

8.3 De-centralised Final Integrated Supervised Assessment (FISA) for Skills Programmes

The FISA is de-centralised, and the assessment standards set by the QCTO must be implemented by the accredited SDP in the development, moderation, and implementation of all FISA for Skills Programmes.

The accredited SDP manages and conducts the FISA and submits learner results for QCTO approval for certification, according to QCTO required compliance standards.

For entrance into the FISA, the learner must have completed the Skills Programme successfully and be found competent in all modules, recorded internally by the SDP. All learners gain entrance to the Final Integrated Supervised Assessment by successfully completing all formal summative assessments conducted by the SDP.

Continuous Assessment

The SDP must ensure that all learners are enrolled with the QCTO at the start of training (within 5 days) in the format required by the QCTO. Continuous assessments are set by the SDP in accordance with the outcomes provided. This may consist of a variety of methods, e.g. practical or written assessments, assignments, projects, demonstrations, presentations or any other form of assessment to assist the learner in the learning process. During training, it is mandatory for formal summative assessments to take place at the end of each module/topic. These results must be formally recorded, and be available for monitoring and/or evaluation by the QCTO.

Final Integrated Supervised Assessment (FISA)

All learners gain entrance to the FISA by successfully completing all formal summative assessments conducted by the SDP.

Format of FISA: A practical assessment integrating the relevant Exit Level outcomes, with simultaneous verbal assessment of embedded knowledge by the assessor before, during or after the FISA. All FISAs must be supervised, and virtual FISAs must be recorded throughout the assessment.

All Exit Level Outcomes must be covered in the FISA. In the FISA, the learner must demonstrate applied knowledge and skills to prove that the competencies of the Skills Programme have been achieved. The FISA may not contain any assessments used in the "Continuous Assessment" process (thus no re-assessment). Special considerations should be made for candidates with special learning needs.

Standards for Final Integrated Supervised Assessment (FISA):

The FISA instrument must be developed and moderated by the SDP and conducted in a supervised environment. It is assessed by means of an **INSTRUMENT** and a **RUBRIC** developed by the SDP for this purpose.

The learner should be provided with a brief/job card/task to demonstrate what the learner should show, know or produce in a product, relevant to the Exit Level Outcomes and the purpose of the Skills Programme. This is the section where the learner must show applied competency (what the learner must be able to do, and to what expected standard).

The learner will be given a simulated training roof/worksite, a range of brief tasks/job cards for solar photovoltaic manufacturing/production in applicable settings. Candidates must be provided with complete and appropriate equipment, tools, materials and measuring instruments and components of solar photovoltaic modules and as provided in the practical skills modules as condition of performance for the task. Candidates must be able to:

- Conduct site inspection to identify potential hazards and risks and implement a mitigation plan
- Perform solar resource estimation, solar PV system sizing and layout including types of solar PV systems (e.g., grid-tied, off-grid, hybrid)
- Electrical test PV Systems executing open-circuit voltage and short-circuit current tests, insulation resistance testing and grounding and bonding checks
- Check the functionality of the installed PV System applying testing procedures (voltage, current, insulation resistance)
- Fault-find and troubleshoot to identify and resolve system performance issues, using diagnostic tools and electrical testing equipment to isolate and correct faults maintaining compliance with safety standards.
- Check compliance with electrical regulations, Health, safety, and environmental regulations, National and international standards with regard to solar system components and basic electrical principles
- Maintain, test and replace inverters and transformers

- Maintain, test and replace cables, cable inter-connections, smart boxes, Solar PV junction/string boxes, string diodes, connectors, fuses, switchgears and control gears and repair switchgears and control gears
- Maintain, test and replace batteries and charge controllers and repair charge controllers where possible.
- Maintain accurate records and compile a maintenance and testing report
- Provide support and advise for improvement

Please take note of the following:

a. Candidates must be provided with clear guidelines and instructions on how to complete the assessment tasks/job, including the assessment criteria and expected outcomes.
b. The duration of the assessment is a maximum of 4 hours.
c. No FISA instrument is allowed to be used verbatim for re-assessment or for a different cohort of learners.

NOTE: Should a learner be found to be competent in all of the above areas, they should be declared “Competent”. If not yet competent in any of the above areas, they should be declared “NYC”, re-trained and then be reassessed with different applicable tasks/scenarios.

Whilst conducting the above, strategic, well-timed questions should be asked of the learner to assess embedded knowledge gained during the skills programme, as well as critical thinking and problem-solving skills: for e.g.

- "Why.....?”
- "What would happen if …?”
- "When …. is done, what would the result be?”
- "How would you deal with …...?”

The marking rubric/compliance checklist used to assess these competencies must include a section for the assessor used in this session to make a note of competencies shown, (or not shown), as well as the questions that were asked, and a summary of the learner's answers, and state whether these are of the acceptable standard or not.

The marking rubric/compliance checklist compiled should contain specific areas marked with an asterisk (*) as compulsory sections for the learner to be declared C (Competent). Compulsory sections include but are not limited to when the candidate's or others' safety would be affected if incorrectly completed. [e.g., what to do in an emergency].

Learners who complete this skills programme will accumulate credits towards the relevant full or part qualification. The Credit Accumulation and Transfer (CAT) Policy may apply to these learners.

Submission of final results

Final results must be submitted to the QCTO in the required format, within 21 days of the date of the FISA, together with the following:

- Completed QA Verification Report on the FISA (QCTO template: various sections).
- Learner results spreadsheet
- A copy of the final Assessment Instrument used, as well as the marking guideline/rubric.

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9. ARTICULATION

9. 1 Articulation for Skills programmes

9.1.1 Work Opportunities:

There are several work opportunities for a person who has successfully completed a Solar Photovoltaic Tester skills programme may access employment opportunities in public and private organisations, become self-employed and may also work as instructors/coach in education and training organisations.

9.1.2 Learning Opportunities:

An individual who has successfully completed a Tester skills programme may access several further learning opportunities available in the energy or engineering fields.

11. NOTES

11.1 Additional Legal or Physical Entry Requirements

- N/A

11.2 Criteria for Accreditation

Accreditation requirements, against which Skills Development Providers (SDP) and Assessment Centres, will be accredited, is found in the Curriculum Document, as listed below.

Curriculum Code: 900279-000-00-00

11.3 Encompassed Trades (where applicable)

- This is not a trade.

12. ASSOCIATED QUALIFICATION(S)/PART-QUALIFICATION(S):

SAQA QUAL ID	QUALIFICATION TYPE	QUALIFICATION DESCRIPTOR	NQF LEVEL	CREDITS
N/A	N/A	N/A	N/A	N/A