Quality Council for Trades & Occupations
www.qcto.org.za
256 Glyn Street, Hatfield, Pretoria, 0083
Private Bag X278, Pretoria, 0001
+27 12 003 1800

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-250607	Solar Photovoltaic Modules Manufacturing	5	60

START DATE	END DATE	LAST DATE FOR ENROLMENT	LAST DATE FOR ACHIEVEMENT
11 Jun 2025	11 Jun 2030	11 Jun 2031	11 Jun 2034

CURRICULUM CODE	900280-000-00-00

PARTNER DETAILS	ORGANISATION NAME	WEBSITE ADDRESS	TELEPHONE NUMBER	LOGO
QUALITY PARTNER - DEVELOPMENT	EWSETA	www.ewseta.org.za	011 2744700	EW SETA

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1. QUALIFICATION/PART-QUALIFICATION/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 Modules Manufacturing

1.4 NQF Level:

NQF Level 5

1.5 Credits:

60

1.6 QCTO Curriculum Code:

900280-000-00-00

1.7 Originator/Quality Partner (QP) – Development

1.7.1 Quality Partner (Qualifications Development):

EWSETA

1.8 Replacement

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 Qualification, Part-Qualifications/Skills Programmes

South Africa is a developing country that aspires to manufacture solar photovoltaic modules to provide alternative source of energy to meet the high demand of energy by the various consumers at residential, commercial and industrial settings to fulfil the Just Energy Transition (JET), Integrated Resource Plan (IRP) objectives relating to energy.

The skills programme has been developed based on the expressed need by the energy industry to promote other sources of renewable energy such as solar energy focusing on the localisation of solar modules manufacturing to meet the needs and expectations of diverse customers in different sectors of the market with local content. This skills programme is aimed at developing employable skill set to manufacture solar photovoltaic modules which will contribute to the improvement of energy supply to industries, farms, businesses, distributors and consumers. The skills programme will expose potential learners to the manufacturing/production process of the solar photovoltaic modules in line with local legal requirements, standards operating procedures and international standards.

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

- Higher Occupational Certificate: Solar Photovoltaic Standalone Service Technician, NQF Level 5, Credits 133, ID: 120863
- National Occupational Certificate: Solar Photovoltaic Standalone Installer, NQF Level 4, Credits 211, ID: 120883
- National Occupational Certificate: Solar Photovoltaic Standalone Mounter, NQF Level 4, Credits 84, ID: 120885
- Skills Programme: Solar Photovoltaic (PV) Installation Practitioner, NQF Level 4, Credits 60
- Skills Programme: Solar Photovoltaic (PV) Installation Planner, NQF Level 5, Credits 60
- Skills Programme: Solar Photovoltaic (PV) Installation Tester, NQF Level 5, Credits 60

2.3 Benefit to the sector, society and the economy:

The economic growth of South Africa is highly dependent on the availability, reliability and sustainability of energy supply hence the need to address the energy crisis has become inevitable and urgent. This skills programme will enhance the skills set that will create interest in solar photovoltaic modules manufacturing landscape using innovation, robotics and Artificial Intelligence (AI), thus contributing towards increased productivity levels contributing to

renewable energy targets to add value to the energy sector and economic growth of the country. Currently there is a global need to reduce carbon footprint to net zero (e,g JET and Paris Accord).

This skills programme will benefit the employers in the industry as qualified learners will possess the requisite competencies to manufacture solar photovoltaic modules, test, identify and troubleshoot faults/defects and/or replace or rework components safely and systematically as well as checking the efficiency of the solar photovoltaic modules and ensure maximum output conforming to quality standards to achieve maximum Return-on-Investment (RoI).

In addition, solar photovoltaic modules will offer substantial benefits to the economy, including costs savings to the industries, commercial, farms and residential, and utility scale settings. The skills, knowledge and understanding demonstrated within this skills programme are essential for social and economic transformation and upliftment within the Renewable Energy, Engineering and Manufacturing environments.

2.4 Typical learners:

- New entrants who are interested in joining the energy sector
- Those already working in the energy industry 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:

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

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

- Solar Photovoltaic Modules Manufacturing

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

This skills programme is targeted towards individuals who are tasked with the responsibility to manufacture Solar photovoltaic modules. The programme will provide the learners with competencies to produce Solar photovoltaic modules in accordance with manufacturing specifications and quality standards.

Learners will be able to implement established manufacturing process and techniques, identify facilities needs and apply operating manufacturing standard operating procedures to meet manufacturing process requirements. Learners will obtain technical/engineering support to resolve and correct problems relating to manufacturing of solar photovoltaic modules.

Qualified learners will be able to understand the working principles of photovoltaic effect, different types of components and materials on a solar photovoltaic module. They will also acquire skills and knowledge to perform photovoltaic modules, testing quality control, and operating and performing regular maintenance and troubleshooting of the manufacturing machinery to ensure continual performance of the manufacturing process.

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

The purpose of this skills programme is to prepare a learner to operate in a Solar Photovoltaic Modules Manufacturing environment.

A Solar photovoltaic Modules Manufacturing person read and interpret the designed datasheet to manufacture solar photovoltaic modules, operate and control the manufacturing machine, maintain and manage machinery (automated or indirect processes) for solar photovoltaic modules manufacturing total manufacturing process applying total quality management system in line with legal, regulatory, standard operating procedures, international standards and industry best practice.

A qualified learner will be able to:

Interpret and implement a solar photovoltaic manufacturing/production plan and schedules
Operate, monitor and control solar photovoltaic modules manufacturing machinery for solar photovoltaic modules manufacturing/production
Test, maintain, diagnose, troubleshoot faulty solar PV modules
Interpret and implement quality control measures in line with total quality management system

3.3 Typical Graduate attributes

- Analytical and critical thinking
- Problem solving skills
- Attention to details
- Teamwork spirit
- A sense of 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 skills programme if they do not meet the formal, minimum entry requirements for admission. RPL assessment provides an alternative access route into a skills programme.

Such an RPL assessment may be developed, moderated, and conducted by the accredited Skills Development Provider which offers that specific 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 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 (FISA):

Learners who have gained the stipulated competencies of the modules of a 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 skills programme is approved by the QCTO.

6. RULES OF COMBINATION

6.1 Components:

KNOWLEDGE/THEORY COMPONENT

Module code	Module title	NQF level	Credits	Mode of delivery
900280-000-00-KM-01	Fundamentals of solar photovoltaic modules manufacturing/production	5	3	Blended
862927-000-00-KM-03	Communication and Administration	4	9	Blended
313109-002-00-KM-05	Maintenance, troubleshooting, fault-finding and repairs to Photovoltaic systems	5	13	Blended
313109-001-00-KM-08	Components of PV systems	5	20	Blended

Total credits of the selected modules: *45*

APPLICATION COMPONENT

PRACTICAL SKILLS MODULE(S)

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
900280-000-00-PM-01	Operate solar photovoltaic manufacturing machine and produce quality solar photovoltaic modules	5	4	Face-to Face
313109-001-00-PM-03	Use tools, measuring instruments and equipment	4	7	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 system	5	4	Face-to-Face

Total credits of credits = 15

6.2 Soft Skills Included:

- 5% of soft skills is included in:862927-000-00-KM-03

6.3. Foundational Learning:

N/A

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

7.1 Exit Level Outcomes (ELO) 1:

Use knowledge of production processes and procedures to interpret manufacturing specifications and schematic drawings

Associated Assessment Criteria (AAC) for ELO 1:

- Solar PV related concepts, principles fundamentals and work ethic are understood and applied
- Solar photovoltaic modules drawings/diagrams and manufacturing specifications are read and interpreted correctly
- Solar PV manufacturing plan and associated schedules are adhered to

7.2 Exit Level Outcomes (ELO) 2:

Apply the principles, procedures and techniques to operate the solar photovoltaic modules manufacturing/production process

Associated Assessment Criteria (AAC) for ELO 2:

- Set priorities on production schedules are evaluated based on equipment efficiency and material supply
- Manufacturing process steps and techniques are followed according to industry standard operational procedures
- Appropriate and different tools, equipment and test instruments are selected, checked and used correctly to ensure that they are in a safe working order
- The machine is set-up, start-up and shutdown correctly according to industry operational procedures and requirements
- The solar photovoltaic manufacturing machinery is monitored and adjusted/calibrated using appropriate tools and testing instruments to operational specifications for optimal operation
- Different types of solar PV modules components are selected and manufactured according to specifications
- Housekeeping is maintained at all times to ensure compliance to health and safety regulatory and environmental requirements in the workplace
- Current and emerging technologies are identified and described in terms of their contribution to the production efficiencies and effectiveness in the work environment

7.3 Exit Level Outcomes (ELO) 3:

Apply testing, diagnosis and troubleshooting techniques and procedures to resolve faults/defects/problems on solar photovoltaic manufacturing/production process

Associated Assessment Criteria (AAC) for ELO 3:

- Faults are identified, rectified and reported according to standard operating procedures
- Different types of defects attributed to solar PV manufacturing and equipment are described and methods of adjustment are applied to fix the machine
- Deviations to normal operational standards are monitored and controlled to ensure that they meet standard operating procedures and specifications
- Corrective action taken is recorded according to company standard operating procedures

7.4 Exit Level Outcomes (ELO) 4:

Apply quality control measures before, during and after solar photovoltaic modules manufacturing process to ensure compliance with the design specifications and regulatory requirements

Associated Assessment Criteria (AAC) for ELO 4:

- Manufacturer's specifications and instructions for the manufacturing/production of solar photovoltaic modules are adhered to at all times
- Quality control principles and methods/techniques and standards are explained, applied and maintained during production process for continuous improvement
- Process parameters are measured to determine conformance and non-conformances for corrective action
- Root-cause analysis and problem-solving techniques are applied to improve quality by troubleshooting faults and eliminating defects
- Housekeeping is performed at all times to ensure a clean working environment to optimise quality
- Solar PV modules manufacturing/production processes are evaluated against industry accepted standard and requirements to determine compliance, findings are reported, recommendations for improvements are documented.
- Relevant documentation is completed correctly and stored according to standards operating procedures

- Solar PV maintenance activities are recorded and reported. according to standards operating procedures

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 weaknesses, 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 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 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 written and/or oral 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:

- Implement **the solar photovoltaic module production plan, associated schedules including materials checks to** confirm quantification, appearance, size and dimensions
- Follow the step-by-step process to manufacture solar photovoltaic modules applying the relevant techniques and principles, safety, health, risk and environmental legal and standards requirements
- Visually inspect and electrically test the module laminate circuit by measuring its I-V characteristics at an inspection station
- Fault-find and troubleshoot to identifying and resolve system performance issues, using correct diagnostic or measuring instruments tools in accordance with standard operating procedures and safety standards.
- Perform solar photovoltaic modules testing and quality control to check the conformance and the quality of the solar photovoltaic modules applying testing procedures (durability and reliability)

- Check compliance with electrical regulations Safety, Health, Risk and Environmental Management legal and regulatory compliance requirements including international standards with regard to solar photovoltaic modules
- Maintain accurate records and compile a testing, maintenance and quality control and reports
- Check proper packaging material for module and pack modules in properly designed cartons for transportation

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 6 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.

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 Modules Manufacturing skills programme, they may access employment opportunities in public and private organisations or similar manufacturing environments.

9.1.2 Learning Opportunities:

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

10. NOTES

10.1 Additional Legal or Physical Entry Requirements

None.

10.2 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:

900280-000-00-00

10.3 Encompassed Trades (where applicable)

This is not a trade.

11. 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