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OCCUPATIONAL SKILLS PROGRAMME CURRICULUM DOCUMENT

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

SKILLS PROGRAMME	SKILLS PROGRAMME ID	TITLE (DESCRIPTOR)	NQF LEVEL	CREDITS
	SP-250819	Solar Photovoltaic (PV) Installation Practitioner	4	60
CURRICULUM CODE	900281-000-00-00			

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

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SECTION 1: CURRICULUM SUMMARY

1.1 Occupational Information:

1.1.1 Associated, Organising Framework for Occupations (OFO) Occupational Code and Title

313109: Solar Photovoltaic Service Technician

1.1.2 Occupation/Specialisation/Part-Qualification/Skills Programme Type, Title, NQF Level, Credits and Curriculum Code, addressed by this Curriculum.

TYPE	TITLE	NQF LEVEL	CREDITS	CURRICULUM CODE
Skills Programme	Solar Photovoltaic (PV) Installation Practitioner	4	60	900281-000-00-00

1.1.3 Alternative titles used by industry:

None

1.2 Curriculum Information:

1.2.1 Articulation for Skills Programmes

(a) Work Opportunities:

There are several work opportunities for a person who has successfully completed a Solar Photovoltaic (PV) Installation Practitioner 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.

(b) Learning Opportunities:

An individual who has successfully completed a Solar Photovoltaic (PV) Installation Practitioner skills programme may access several further learning opportunities available in the energy or engineering fields.

1.3 Curriculum Structure:

1.3.1 Knowledge Modules:

- 313109-001-00-KM-08, Components of PV systems, NQF Level 4, Credits 20

Total Credits = 20

1.3.2 Practical Skills Modules:

- 313109-001-00-PM-03, Use tools, measuring instruments and equipment, NQF Level 4, Credits 7
- 313109-001-00-PM-06, Install the mechanical components of a PV system, NQF Level 4, Credits 10

- 313109-001-00-PM-07, Install the electrical components of a PV system and inter-connect the system, NQF Level 4, Credits 15
- 121905-000-00-PM-10, Conduct and control project communication and stakeholder interaction, NQF Level 5, Credits 8

Total number of credits: 40

1.4 Entry Requirements:

- NQF level 3 qualification with Mathematics

1.5 Recognition of Prior Learning (RPL):

1.5.1 RPL for Access:

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.

1.5.2 RPL for Exemption:

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.

1.5.3 RPL for awarding credits:

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 issued with the QCTO certificate for the skills programme. Quality Partners are responsible for ensuring the RPL mechanism and process for skills programme is approved by the QCTO.

1.6 List of Qualification(s)/Part- Qualification(s)/Skills Programme(s) Related to this Curriculum

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

SECTION 2: OCCUPATIONAL/SPECIALISATION/PART-QUALIFICATION/SKILLS PROGRAMME PROFILE

2.1 Purpose:

The purpose of this skills programme is to prepare a learner to operate as a Solar Photovoltaic Installation Practitioner.

A Solar Photovoltaic (PV) Installation Practitioner liaises with clients, plans for photovoltaic system installation, analyses and interprets the PV design specifications, identifies and selects the appropriate components, equipment, tools and materials, perform solar PV installation work up to 15kW solar PV in residential settings, performs functionality checks, and maintains a PV system functionality and hands-over to the client adhering to all statutory requirements under supervision of a registered person.

2.2 Tasks:

TASK	LINKS TO ELO
Task 01: Plan for the installation of a photovoltaic system	ELO 1: Apply planning and preparation methods and procedures for solar PV system installation.
Task 02: Install a solar photovoltaic system	ELO 2: Apply procedures for the installation of mechanical and electrical components of solar PV system in different settings
Task 03: Test and verify the functionality of installed PV components under supervision	ELO 3: Apply testing and verification methods, techniques to ensure the functionality of general mechanical and electrical solar PV systems installations
Task 04: Perform safe routine maintenance and fault-finding on the installed solar PV system	**ELO 4:** Apply fault-finding steps and safe maintenance practices to ensure efficient solar photovoltaic system performance

2.3 Occupational Task Details:

2.3.1 Task 1

Plan for the installation of a solar photovoltaic system

Unique Product or Service:

- Designed or customised PV system ready to be installed

Occupational Responsibilities:

- Plan and prepare for solar PV system installation, NQF Level 4
- Work at heights, NQF Level 2
- Use tools and equipment and measuring instruments, NQF Level 4
- Design and construct electrical and electronic circuits, NQF Level 4

Occupational Contexts:

- Structured planning and preparation processes for solar PV installation, NQF Level 4
- Processes to plan and prepare for the installation and commissioning of PV systems, NQF Level 4

2.3.2 Task 2

- Install a solar photovoltaic system

Unique Product or Service:

- Fully-operational solar PV system

Occupational Responsibilities:

- Install the mechanical components of a PV system, NQF Level 4
- Install the electrical components of a PV system and inter-connect the system, NQF Level 4

Occupational Contexts:

- Processes to install the mechanical components of PV systems, NQF Level 4
- Processes to install the electrical components of PV systems and to commission the systems, NQF Level 4

2.3.3 Task 3

Test and verify the functionality of installed PV components under supervision

Unique Product or Service:

Fully operational and optimally functioning PV components and system

Occupational Responsibilities

Test and verify the operability of installed PV components under supervision, NQF Level 4

Occupational Contexts:

Processes to check and test the functionality of PV components, NQF Level 4

2.3.4 Task 4

Perform safe routine maintenance and fault-finding on the installed solar PV system

Unique Product/Service

Functional and compliant Solar PV system

Occupational Responsibilities

Perform fault-finding and troubleshooting faults mechanical and electrical solar PV system installations, NQF Level 4

Communicate with stakeholders involved in the project, NQF Level 5

Occupational Contexts

Solar PV system hand-over processes, NQF Level 4

SECTION 3: CURRICULUM COMPONENT SPECIFICATIONS

3.1 Knowledge Module Specifications:

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
313109-001-00-KM-08	Components of PV system	4	20	Blended

3.1.1 313109-001-00-KM-08, Components of solar PV systems, NQF Level 4, Credits 20

Knowledge Module (KM) - 01

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
313109-001-00-KM-08	Components of PV system	4	20	Blended

(a) Purpose of Knowledge Module:

The main focus of the learning in this knowledge subject is the components of a PV system and theoretical concepts related to PV.

(b) List of Knowledge Topics:

TOPIC CODE	TOPIC TITLE	% OF TIME TO BE SPENT
KM-08-KT01	PV array systems and PV applications	(13%)
KM-08-KT02	Solar radiation	(5%)
KM-08-KT03	The photovoltaic effect	(5%)
KM-08-KT04	Solar cell types	(13%)
KM-08-KT05	Electrical properties of solar cells	(5%)
KM-08-KT06	PV modules	(10%)
KM-08-KT07	PV junction/string boxes, smart boxes, string diodes, connectors and fuses	(8%)
KM-08-KT08	Inverters	(13%)
KM-08-KT09	Cabling, wiring and connection systems, installation materials and switching (direct current load switch [DC main switch] and AC switch disconnector)	(8%)
KM-08-KT10	Batteries	(10%)
KM-08-KT11	Charge Controllers	(10%)

(c) Detailing each topic listed above into topic elements:

KM-08-KT01 PV ARRAY SYSTEMS AND PV APPLICATIONS (13%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0101	Stand-alone systems (without storage, with storage, hybrid systems)	33%
KT0102	Grid-connected systems	34%
KT0103	Components of the two systems	33%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	**IAC DESCRIPTION**	**% OF TIME TO BE SPENT**
IAC0101	Describe stand-alone systems and grid-connected systems	**30%**
IAC0102	Identify their main components and describe their functions	**40%**
IAC0103	Explain the principles of operation of these two systems	**30%**

KM-01-KT02 SOLAR RADIATION (5%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0201	Sun as energy source	12**%**
KT0202	Distribution of solar radiation	12**%**
KT0203	Direct and diffuse radiation	11**%**
KT0204	Angle definition	11**%**
KT0205	Sun position and solar spectrum	11**%**
KT0206	Solar radiation on an inclined plane	11**%**
KT0207	Ground reflection	11**%**
KT0208	Measuring solar radiation	11**%**
KT0209	Tracking PV rays	10**%**

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0201	Explain the concepts of irradiance, insolation, energy content and the solar constant	9%
IAC0202	Explain the difference between direct and diffuse radiation	9%
IAC0203	Explain the concept of angle definition and identify some of the symbols used to depict the angles	9%
IAC0204	Explain the relationship between solar altitude and air mass	9%
IAC0205	Describe solar positions and air mass (AM) in different places in the world	9%
IAC0206	Explain the concept of the solar spectrum and describe how the sun's position affects the solar spectrum	9%
IAC0207	Identify the factors that reduce the passage of light through the earth's atmosphere	9%
IAC0208	Explain the impact of angle of inclination on solar radiation	9%
IAC0209	Explain the concept of ground reflection in terms of the albedo value	9%
IAC0210	Identify the instruments used to measure radiation and describe their accuracy	9%
IAC0211	Describe the advantages of tracking PV arrays and identify tracker systems	10%

KM-08-KT03 THE PHOTOVOLTAIC EFFECT (5%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0301	Operation of a solar cell	50%
KT0302	Design and function of a crystalline silicon solar cell	50%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0301	Explain the concept of intrinsic conductivity using the atomic theory	33%
IAC0302	Describe the design and function of a crystalline silicon solar cell	34%
IAC0303	Explain the concept of energy balance	33%

KM-08-KT04 Solar cell types (13%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0401	Crystalline silicon	5%
KT0402	Monocrystalline (single-crystal) silicon cells	5%
KT0403	Polycrystalline silicon cells	5%
KT0404	Polycrystalline UMG silicon cells	5%
KT0405	Ribbon pulled silicon cells	5%
KT0406	Texturing and anti-reflection coating	5%
KT0407	Front contacts	5%
KT0408	Back contacts	5%
KT0409	Alternatives for wafer production	5%
KT0410	High performance cells (manufacturing processes - float-zone method, optimised cell structures, surface passivation, selective emitters, edge isolation, back surface field, point contacts, back-contacted solar cells [types include MWT, EWT and back-contact (IBC) solar cells]; polarisation effect [HIT solar cells, transparent solar cells, spherical solar cells, silver cells])	10%
KT0411	Thin-film cell technology	10%
KT0412	Amorphous silicon cells	5%
KT0413	Micromorphous solar cells	5%
KT0414	Copper indium diselenide (CIS) cells	5%
KT0415	Cadmium telluride cells (CdTe)	5%
KT0416	Nano-structured solar cells (nano-structured CIS cells, organic solar cells: dyesensitised nano-crystalline cells)	5%
KT0417	Concentrator solar cells and concentrating systems	5%
KT0418	Comparison of solar cell types and trends	5%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0401	Explain the use of silicon in crystalline solar cells	25%
IAC0402	Describe polycrystalline, monocrystalline and amorphous cells in detail	25%
IAC0403	Discuss thin-film technology	25%
IAC0404	Briefly describe each of the other solar cell types	25%

KM-08-KT05 ELECTRICAL PROPERTIES OF SOLAR CELLS (5%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0501	Equivalent circuit diagrams of solar cells (additional solar cell models, the effective solar cell model)	40%
KT0502	Spectral sensitivity	30%
KT0503	Efficiency of solar cells and PV modules	30%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0501	Discuss two solar cell models using circuit diagrams	35%
IAC0502	Explain spectral sensitivity of different solar cells	35%
IAC0503	Explain efficiency of solar cells and PV modules	30%

KM-08 -KT06 PV MODULES (10%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0601	Cell stringing	10%
KT0602	Glass and cell encapsulation (EVA, PVB, PTFE, lonomer, TPU, acrylates or silicon (TPSE), new module concepts)	10%
KT0603	Module junction boxes and connection cables	10%
KT0604	Module frames	10%
KT0605	Types of modules and classification of modules (substrate, frame structure, construction- specific additional functions etc.)	10%

KT0606	Design options for PV modules (cell type, glass size, cell coverage, glass type, glass format, cell shape, cell contacting, encapsulation material, cell background etc.)	10%
KT0607	Wiring symbols	10%
KT0608	Module characteristics	10%
KT0609	Irradiance dependence and temperature characteristics	5%
KT0610	Hot spots, bypass diodes and shading	5%
KT0611	Electrical characteristics of thin-film modules	5%
KT0612	Expansion and contraction of modules	5%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0601	Explain the importance of conducting a scoping exercise in a work management process	10%
IAC0602	Differentiate and discuss the various magnitude between scope of work and job scoping making use of examples	10%
IAC0603	Identify and describe the basic planning process steps with regard to work at hand	10%
IAC0604	Describe the module frames in terms of use, mounting and types	10%
IAC0605	Describe the different types of modules and design options	10%
IAC0606	Draw the wiring symbol used for solar cells, solar cell string, PV module, string of PV modules, PV sub-array and PV array	10%
IAC0607	Discuss briefly the characteristics of different types of modules	5%
IAC0608	Discuss the relationship between irradiation, temperature, power and voltage	10%
IAC0609	Explain hot spot and shading and the role of diodes in these instances	10%
IAC0610	Explain the electrical characteristics of thin-film modules	10%
IAC0611	Explain the aspect of expansion and contraction of modules	5%

KM-08-KT07 PV JUNCTION/STRING BOXES, SMART BOXES, STRING DIODES, CONNECTORS AND FUSES (8%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0701	PV junction/string boxes	20%
KT0702	Smart boxes	20%
KT0703	String diodes	20%
KT0704	Connectors	20%
KT0705	Fuses	10%
KT0706	Telemetry/intelligence	10%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0701	Describe the functions of PV junction/string boxes, smart boxes, string diodes, connectors and fuses	50%
IAC0702	Explain telemetry/intelligence system of smart boxes	50%

KM-08-KT08 INVERTERS (13%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0801	Wiring symbols, inverter symbols (single and three phase)	15%
KT0802	Internal circuit diagrams	15%
KT0803	Self-commuted inverters (with high frequency, transformerless)	15%
KT0804	Specifications, characteristics and properties of inverters (different efficiencies like conversion, static, Euro, Californian, overall)	10%
KT0805	Grid-connected inverter types and construction sizes in various power classes (multiple MPP trackers [multi-string concept]; master slave concept in low power ranges, three phase concept in low power ranges, thin-film optimised inverters, back-up inverters or inverters optimised for self- use, medium voltage inverter)	20%
KT0806	Stand-alone inverters (sine-wave and square-wave)	15%
KT0807	Telemetry/intelligence of inverters	10%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0801	Describe the functions of the inverter	15%
IAC0802	Identify and explain inverter symbols	5%
IAC0803	Draw the internal circuit diagram for an inverter and explain its operating principles	10%
IAC0804	Discuss the different efficiencies and overload behaviour of inverters	15%
IAC0805	Discuss the inverter's recording of operation data	10%
IAC0806	Discuss the characteristics and properties of inverters	10%
IAC0807	Explain the principle of grid connection when using an inverter	15%
IAC0808	Describe the types of inverters	10%
IAC0809	Explain telemetry/intelligence system of inverters	5%
IAC0810	Explain how to interpret inverter data sheets	5%

KM-08-KT09 CABLING, WIRING AND CONNECTION SYSTEMS, INSTALLATION MATERIALS AND SWITCHING (DIRECT CURRENT LOAD SWITCH [DC MAIN SWITCH] AND AC SWITCH DISCONNECTOR) (8%)

TOPIC ELEMENT CODE	TOPIC ELEMENT TITLE	% OF TIME TO BE SPENT
KT0901	Module and string cables	10%
KT0902	Connection systems	10%
KT0903	DC main cable	10%
KT0904	AC connection cable	10%
KT0905	Installation materials (PG protective tubing, finned tubing, cable duct, cable ties, cable clamps and nail clamps	10%
KT0906	Direct current load switch (DC main switch)	10%
KT0907	Miniature circuit breakers (MCBs)	10%
KT0908	Residual current device (RCD)	10%
KT0909	Isolation switches and grid integration	10%
KT0910	Integration of decentralised feed-in sources in the grid management process	5%
KT0911	Metering	5%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0801	Describe module and string cables, connection systems, the DC main cable and the AC connection cable and explain their functions	**20%**
IAC0802	Describe the installation materials and explain their functions	**10%**
IAC0803	Describe the impact of quality of cables in terms of system losses	**15%**
IAC0804	Explain the functions of direct current load switch (DC main switch), miniature circuit breakers (MCBs), residual current device (RCD), isolation switches and grid integration	**20%**
IAC0805	Describe the two types of residual current devices	**15%**
IAC0806	Elaborate on the integration of decentralised feed-in sources in the grid management process	**20%**

KM-01-KT09 BATTERIES (10%)

TOPIC ELEMENT CODE	TOPIC ELEMENT TITLE	% OF TIME TO BE SPENT
KT0101	Construction and operating principles	10**%**
KT0102	Types and designs of lead-acid batteries (lead-acid gel batteries, stationary tubular plate batteries [types OPzS and OPzV], block batteries with positive plates [OGi block], excursus modern battery concepts – lithium-ion batteries etc.)	20**%**
KT0103	Batteries and system specifications	15**%**
KT0104	Operating behaviour and characteristics of lead-acid batteries (voltage, charging and discharging, state of charge)	10**%**
KT0105	Ageing effects (acid stratification, sulphation, corrosion, studging, drying out)	10**%**
KT0106	Battery replacement	10**%**
KT0107	Battery safety and maintenance	10**%**
KT0108	Recycling	15%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC101	Describe the construction, types and designs of batteries used in PV systems	20%
IAC102	Explain the operating principles, operating behaviour and characteristics of lead acid batteries	15%
IAC103	Discuss ageing effects on batteries	10%
IAC104	Describe the criteria and specifications to be used when selecting batteries for PV system	15%
IAC105	Describe the safety requirements when working with batteries	15%
IAC106	Describe battery replacement procedures	10%
IAC107	Describe battery maintenance and recycling procedures	15%

KM-08-KT11 CHARGE CONTROLLERS (10%)		
TOPIC ELEMENT CODE	**TOPIC ELEMENT TITLE**	**% OF TIME TO BE SPENT**
KT0101	Deep discharge protection and charging	20%
KT0102	Series controller	20%
KT0103	Shunt controllers	10%
KT0104	MPP charge controllers	20%
KT0105	Stand-alone inverters (sine-wave inverters, square-wave inverters, application criteria for inverters in stand-alone systems)	15%
KT0106	Telemetry/intelligence of charge controllers	15%

(d) Internal Assessment Criteria (IAC) and Weight

IAC CODE	IAC DESCRIPTION	% OF TIME TO BE SPENT
IAC0101	Describe the main function of a charge controller	20%
IAC0102	Describe the essential features expected from a modern charge controller	15%

IAC0103	Describe a deep discharge protector and explain its function	**10%**
IAC0104	Explain the 3- or 4-stage charging cycle	**15%**
IAC0105	Describe the functions and operating principles of series controllers, shunt controllers and MPP charge controllers	**20%**
IAC0106	Explain telemetry/intelligence system of charge controllers	**20%**

3.1.2 Criteria for accreditation

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	Access to training facilities conducive for classroom training, learning materials, ffacilitation aids, media, Whiteboard, Flipchart Stand, Computer, Access to Internet, Learning Management System (LMS) and Learning Management Information System (LMIS)
CONSUMABLES	None

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• Relevant qualification at NQF Level 5 in energy-related qualification • Relevant technical experience in the solar PV installations that can be established by recognition of prior learning (RPL)
FACILITATOR/LEARNER RATIO	1: 24

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• Compliance with relevant occupational health, safety and environmental regulations.

3.1.3 Exemptions

- None

3.2 Practical Skill Module (PM) Specifications:

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
313109-001-00-PM-03	Use tools, measuring instruments and equipment	4	7	Face-to-Face
313109-001-00-PM-06	Install the mechanical components	4	10	Face-to-Face
313109-001-00-PM-07	Install the electrical components of a PV system and inter-connect the system	4	15	Face-to-Face
121905-000-00-PM-10	Conduct and control project communication and stakeholder interaction	5	8	Face-to-Face

3.2.1 313109-001-00-PM-03, Use tools, measuring instruments and equipment, NQF Level 4, Credits 7

Practical Module (PM) - 01

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
313109-001-00-PM-03	Use tools, measuring instruments and equipment	4	7	Face-to-Face

(a) Purpose of the Practical Skills Module:

The focus of the learning in this module is on providing the learner with an opportunity to select, use and care for a range of tools and equipment relevant to the PV Technician

(b) List of Practical Skill Activities:

PRACTICAL SKILL CODE	ACTIVITY TITLE
PM-03-PS01	Select, use and care of engineering hand tools
PM-03-PS02	Select, use and care for power tools and equipment
PM-03-PS03	Perform marking-off activities
PM-03-PS04	Select, use and care for mechanical instruments
PM-03-PS05	Rivet materials together

PM-03-PS06	Perform soft soldering activities
PM-03-PS07	Lift loads

(c) Scope of each Practical Skill Activity:

PM-03-PS01 SELECT, USE AND CARE OF ENGINEERING HAND TOOLS	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE:	
Given work instructions, checklists, work area, drawings, documents, templates, forms, safety and quality principles, hand saws, hammers, screw drivers, sockets, spanners, chassis punches, side cutters, pliers, wire strippers, drill bits, measuring and marking off tools, fastening tools, equipment standard operating procedures and, statutory requirements, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0101	Select engineering hand tools and equipment for serviceability
PA0102	Use engineering hand tools and equipment
PA0103	Respond appropriately to potential hazards and risks related to the use of the engineering hand tools and equipment

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0101	Workshop procedures including housekeeping practices according to statutory requirements
AK0102	Techniques for maintaining hand tools and equipment
AK0103	Techniques for using tools and equipment
AK0104	Practices related to quality, health, safety, and protection of the environment when using hand tools

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0101	The correct application of tools is used for cutting steel, copper, aluminium, plastics and synthetic materials as per manufacturers‟ specifications
IAC0102	The correct application of tools is used to loosen or fasten a range of different types and sizes of nuts or bolts and different types and sizes of screws as per manufacturer's specifications

IAC0103	The correct application of tools is used to strip or cut a range of different types and sizes of electrical wire as per manufacturer's specifications
IAC0104	Sharp edges on chisel/punch type tool heads with "mushroom effect" are removed to ensure that they can be used safely; then tips with burs or chips are sharpened for effective use
IAC0105	Flat screw driver tips with burs or chips are filed and prepared to manufacturer's specification ensuring that they are serviceable
IAC0106	The adjusting/moving mechanisms of shifting spanners, gas pump pliers, vice grip, dividers, stillson wrench are lubricated to ensure free movement and serviceability
IAC0107	Engineering files cutting edge are cleaned using a wire brush to ensure serviceability
IAC0108	Scribers, dividers and centre punches are sharpened to ensure serviceability

PM-03-PS02 SELECT, USE AND CARE FOR POWER TOOLS AND EQUIPMENT	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given work instructions, work area, documents, templates, drilling machines (portable and pedestal), grinders, and saws, bench grinder, standard operating procedures and, statutory requirements, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0201	Select a power tool or equipment pertaining to specific job requirements
PA0202	Use fixed power or equipment tools
PA0203	Use portable power or equipment tools
PA0204	Care for and store power tools or equipment and their accessories
PA0205	Respond appropriately to potential hazards and risks related to the use of power tools

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0201	Workshop procedures including housekeeping practices according to statutory requirements
AK0202	Safety practices relating to the use of power tools including the use of personal protective equipment, electrical and fire protection
AK0203	Types and uses of fixed and portable power tools and equipment

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0201	Power tools and equipment are selected according to the task requirements
IAC0202	Pre-operational check is carried out in terms of safety requirements and function
IAC0203	Hazards associated with the use of power tools or equipment are recognised and necessary precautions taken according to workshop procedures
IAC0204	Faulty and unsafe tools or equipment are identified and reported in accordance with standard operating procedures
IAC0205	Personal safety equipment is selected and used according to tool or equipment requirement
IAC0206	Fixed and portable power tools are selected and set up according to job requirements
IAC0207	All guards and securing mechanisms are effectively utilised in terms of job requirements
IAC0208	Fixed and portable power tools and equipment are used safely and in accordance with manufacturer's specifications
IAC0209	Power tools and equipment are inspected, cleaned and lubricated after use according to workshop practices and/or manufactures specifications
IAC0210	Loose items are secured and minor defects repaired in accordance to workshop procedures
IAC0211	Portable power tools, equipment and accessories are stored in accordance to workshop procedures

PM-03-PS03 PERFORM MARKING-OFF ACTIVITIES	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given appropriate tools and equipment, dimensions, raw materials, instructions, templates and assignments to perform marking-off, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0301	Plan and prepare for the marking-off of materials using templates
PA0302	Select marking-off tools appropriate for different materials and sizes and to prevent negative influences on the final product
PA0303	Interpret job instructions and engineering drawings
PA0304	Perform marking-off using drawings, tools and equipment according to job specifications

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0301	Method of checking and evaluating marking-off dimensions from working drawings (including methods of transferring dimensions)
AK0302	Tests for strength, flexibility and defects in raw materials
AK0303	Marking off tools and equipment include to centre punch and hammer, V-shaped block, marking-off scribe, steel rule, steel compass, block and flat table, height gauge, dividing heads, marking agents (pens, paint, chalk, marking blue), rotary tables, trammels and parallels
AK0304	Marking off templates

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0301	Preparations for marking-off are made to ensure smooth operation
IAC0302	Check and evaluate marking-off dimensions from working drawings
IAC0303	Check and test raw materials to be marked-off defects
IAC0304	Convert scales from working drawings using various suitable methods
IAC0305	The sequence of activities for the marking-off process is planned to ensure a smooth process
IAC0306	Templates are used on material as per standard procedure, to maintain accuracy
IAC0307	Marking off is concluded to specifications and checked for quality
IAC0308	Work shows consideration for quality

PM-03-PS04: SELECT, USE AND CARE FOR MECHANICAL INSTRUMENTS

PRACTICAL SKILL ACTIVITY SCOPE OUTLINE

Given work instructions, work area, documents, including but not limited to inclinometers, tape measures, digital and laser distance meters, thermometers, steel rulers, engineer's squares, vernier callipers, torque wrench standard operating procedures and, statutory requirements the learner must be able to:

PRACTICAL SKILL ACTIVITY ELEMENT CODES	PRACTICAL SKILL ACTIVITY ELEMENTS
PA0401	Identify and select mechanical measuring instruments
PA0402	Use and interpret mechanical measuring instrument readings

PA0403	Care for mechanical measuring instruments

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0401	Handling procedures related to measuring instrument
AK0402	Basic operating principles of electrical measuring instruments
AK0403	Types, applications and functions of electrical measuring instruments

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0401	Job instructions are interpreted correctly and sequence of operation is determined
IAC0402	Unsafe and faulty measuring instruments are identified visually and marked for repair or replacement
IAC0403	Mechanical measuring instruments are checked for correct operation and functionality
IAC0404	Mechanical measuring instruments are set-up and used in accordance with their specifications
IAC0405	Mechanical measuring instruments are read correctly
IAC0406	Results are recorded on appropriate documentation
IAC0407	Results are accurately interpreted against the specifications of the job requirements
IAC0408	Mechanical measuring instruments are placed and stored in accordance with manufacturer's specifications and workshop standards

PM-03-PS05 RIVET MATERIALS TOGETHER	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given two sheets of metal or plastic, drilling machine, pop rivet, rivets, washers etc. the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0201	Make holes using the drilling machine and appropriate measuring and marking tools
PA0202	Rivet the sheets together

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0501	Equipment for riveting: riveting machine, drilling machine, washers, rivets (standard, countersunk, blind)
AK0502	Technique for riveting

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0501	Materials to be riveted together are marked where holes will be made
IAC0502	Drilling machine is used correctly to make holes
IAC0503	Appropriate rivet and washer sizes are chosen
IAC0504	Pop rivet is used correctly to complete the task
IAC0505	Safety requirements are adhered to

PM-03-PS06 PERFORM SOFT SOLDERING ACTIVITIES	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given work instructions, work area, checklists, soldering irons; insulation strippers (thermaltype insulation strippers and mechanical wire strippers); wire bending tools; solder; flux; basic soldering connections (turret, bifurcated, hook, surface mounts, cups), solder sucker, accessories, standard operating procedures and statutory requirements the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0601	Solder various wire joints
PA0602	Solder components on a PC board or Vero board or joints
PA0603	De-solder components

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0601	Soldering techniques and applications
AK0602	Safety practices relating to the use of soldering equipment including the use of personal protective equipment
AK0603	De-soldering methods
AK0604	Handling and storage of soldering equipment and accessories

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0601	Work area is inspected for safe working conditions and corrective action is taken where required
IAC0602	Applicable soldering equipment is selected as required by task
IAC0603	Soldering material is correctly selected as required by the task
IAC0604	All connections are cleaned of any dirt or oxidation
IAC0605	Tinning of wire and connections are done according to manufacturer's specifications
IAC0606	Connections are soldered according to specifications and techniques
IAC0607	Components are laid out on the circuit board according to the circuit diagram
IAC0608	Components are soldered according to soldering techniques

PM-03-PS07 LIFT LOADS	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given appropriate lifting tools and equipment and assignments, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0701	Assess the nature of the lifting task and the associated risks
PA0702	Plan the lifting process (including making simple calculations)
PA0703	Identify and select lifting equipment in accordance with load requirements
PA0704	Inspect the lifting equipment for safety and defects

PA0705	Sling loads in accordance with load requirements and worksite procedures
PA0706	Use applicable communication methods during slinging operations
PA0707	Lift, convey and place/stack loads safely

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0701	Lifting equipment (chain slings, rope slings, steel wire slings, synthetic web slings, shackles, eyebolts, guide ropes, plate grabs, chain blocks, rope tackles/rope blocks jacks, come-alongs, small floor cranes, hoists [tirfor, coffin], lifting brackets, fasteners, colour codes of slings)
AK0702	Equipment defects (include wear, corrosion, stretched links, deterioration of splices, cracks, nicks and broken strands, contamination through oil and paint [synthetic slings])
AK0703	Load capacity of lifting equipment and the reason for not exceeding it
AK0704	Communication methods used may include the use of two-way radios, standard hand signals and warning devices such as hooters and whistles
AK0705	Lifting techniques
AK0706	Safety requirements
AK0707	Caring and storage procedures
AK0708	Load capacity for this practical skill not to exceed 2t (two metric tons)

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0701	The task is assessed and an appropriate lifting technique is chosen
IAC0702	Risks are assessed and mitigated
IAC0703	Lifting task is planned in accordance with the task
IAC0704	Lifting equipment is selected and checked and its lifting capacity is noted
IAC0705	Lifting task is completed keeping in consideration all safety requirements
IAC0706	Equipment is cleaned, lubricated and stored according to procedures

3.2.2. Criteria for accreditation

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	Work area, categories of tools equipment and materials described in this module
CONSUMABLES	None

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	Facilitators should have a minimum Level 5 qualification that includes competencies related to using the tools and equipment included in this module.
FACILITATOR/LEARNER RATIO	1:12

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	Compliance to the relevant occupational health, safety and environmental protection legislation

3.2.3 Exemptions

- None

3.2.2 313109-001-00-PM-06, Install the mechanical components of a PV system, NQF Level 4, Credits 10

Practical Module (PM) - 02

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
313109-001-00-PM-06	Install the mechanical components of a PV system	4	10	Face-to-Face

(a) Purpose of the Practical Skills Module:

The focus of the learning in this module is on providing the learner an opportunity to mount and install the mechanical components of a stand-alone and grid connected PV systems designed for household and commercial purposes.

(b) List of Practical Skill Activities:

PRACTICAL SKILL CODE	ACTIVITY TITLE
PM-06-PS01	Install the mounting system
PM-06-PS02	Install PV modules

(c) Scope of each Practical Skill Activity:

PM-06-PS01 INSTALL THE MOUNTING SYSTEM	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE:	
The focus of the learning in this module is on providing the learner an opportunity to mount and install the mechanical components of a stand-alone and grid connected PV systems designed for household and commercial purposes.	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0101	Prepare roof/site for installation (roof attachments; cut tile etc.)
PA0102	Determine array attachment locations and locate array footprint
PA0103	Install structural attachments, module support frame and rack components
PA0104	Plumb and level array structure (rails)
PA0105	Weatherproof penetrations and protect cut surfaces from corrosion

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0101	Safety requirements including PPE
AK0102	Mounting options and methods
AK0103	Array, array structure, array attachment locations, array footprint
AK0104	Tools and equipment and using and caring for them
AK0105	Roofing systems
AK0106	Installation sites
AK0107	Weatherproofing methods
AK0108	Structural attachments, module support frame and rack components
AK0109	Manufacturer's specifications and guarantees

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0101	Roof/site is prepared to designer/installer requirements
IAC0102	Structural attachments, module support frame and rack components are mounted according to instructions
IAC0103	Array rails are installed safely and correctly
IAC0104	Weatherproofing is applied according to requirements
IAC0105	The protection equipment is selected according to the task and the level of protection is applied as per statutory requirements
IAC0106	Work area is returned to original state and tools and equipment are cleaned and stored according to procedure

PM-06-PS02 INSTALL PV MODULES	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given installed mounting system, PV modules, compass, inclinometer (or angle of tilt template and spirit level), manufacturing specifications, installation diagrams, hand and power tools, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0201	Read and interpret installation drawings
PA0202	Secure module wiring
PA0203	Fasten modules to mounting safely and correctly
PA0204	Torque module fasteners
PA0205	Confirm module frame grounding
PA0206	Align modules aesthetically

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0201	Method for interpreting diagrams and diagram scales
AK0202	Hazard and risks, and personal protective equipment
AK0203	Module installing techniques
AK0204	Aesthetics in module installation

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0201	Interpreting of drawing is correct
IAC0202	Modules are installed, fastened and torque onto mounting safely and as per requirements

3.2.2. Criteria for accreditation

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	Electrical and Solar PV environment, categories of tools and equipment in order for learners to be able to construct electrical and electronic circuits. Learning Management System (LMS), Learning Management Information System (LMIS)
CONSUMABLES	None

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• Relevant Level 5 qualification plus formal training in PV, or • A qualified PV Technician with at least 2 years of experience or • A qualified electrician/millwright with PV related training and/or 2 years‟ relevant experience working within a PV environment, or • Relevant accredited facilitation course with PV related formal training or experience
FACILITATOR/LEARNER RATIO	1:12

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	Compliance to the relevant occupational health, safety and environmental protection legislation

3.2.3 Exemptions

- None

3.2.3 313109-001-00-PM-07, Install the electrical components of a PV system and inter-connect the system, NQF Level 4, Credits 15

Practical Module (PM) - 03

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
313109-001-00-PM-07	Install the electrical components of a PV system and interconnect the system	4	15	Face-to-Face

(a) Purpose of the Practical Skills Module:

The focus of the learning in this module is on providing the learner an opportunity to install the electrical components, cabling and connections for PV systems designed for household and commercial purposes.

(b) List of Practical Skill Activities:

PRACTICAL SKILL CODE	ACTIVITY TITLE
PM-07-PS01	Mitigate electrical hazards prior to installation of electrical components
PM-07-PS02	Install grounding systems
PM-07-PS03	Install conduits and wire-ways
PM-07-PS04	Install electrical components
PM-07-PS05	Install circuit conductors
PM-07-PS06	Install system instrumentation
PM-07-PS07	Install battery components

(c) Scope of each Practical Skill Activity:

PM-07-PS01 MITIGATE ELECTRICAL HAZARDS PRIOR TO INSTALLATION OF ELECTRICAL COMPONENTS	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE:	
Given equipment to measure voltages, equipment, and hand and power tools, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0101	Implement site safety plan (hazard analysis, ladder safety, fall protection plan)
PA0102	Implement lock-out procedures

PA0103	Determine voltage levels of interconnections
PA0104	Clarify the maximum working voltage
PA0105	Select required PPE based on system design (arc flash, shock, burn, voltage, etc.) Select required PPE based on system design (arc flash, shock, burn, voltage, etc.)
PA0106	Disconnect all unnecessary live circuits
PA0107	Measure voltage on equipment before proceeding with work
PA0108	Inspect safety equipment
PA0109	Inspect test equipment
PA0110	Maintain safety equipment
PA0111	Inspect hand and power tools

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0101	Safety requirements (including PPE)
AK0102	Lock-out procedures
AK0103	Measuring voltages
AK0104	Equipment inspection procedures
AK0105	Manufacturer's specifications and guarantees

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0101	All safety aspects are correctly implemented
IAC0102	Inspections are carried out according to procedures
IAC0103	Disconnections are carried out correctly
IAC0104	Measurement of voltage levels is conducted correctly

PM-07-PS02 INSTALL GROUNDING SYSTEMS
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE
Given electrical equipment, and tools and equipment, the learner must be able to:

PRACTICAL SKILL ACTIVITY ELEMENT CODES	PRACTICAL SKILL ACTIVITY ELEMENTS
PA0201	Install module, inverter and mounting system grounding
PA0202	Ground all noncurrent-carrying metal parts
PA0203	Install grounding electrode conductor
PA0204	Bond all electrical equipment
PA0205	Prepare surfaces for electrical connections
PA0206	Make grounding electrode connection
PA0207	Install grounding electrode(s)
PA0208	Install supplementary ground electrode
PA0209	Install system grounds
PA0210	Determine grounding conductor size
PA0211	Install DC ground-fault protection

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0201	Grounding systems
AK0202	DC ground-fault protection
AK0203	Hazards, risks and safety procedures

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0201	Grounding for all electrical components is installed according to procedure and statutory requirements
IAC0202	Electrical equipment is bonded according to procedure
IAC0203	Surfaces for electrical connections are prepared according to procedures

PM-07-PS03 INSTALL CONDUITS AND WIRE-WAYS
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE
Given wire-ways, conduits, fittings and tools and equipment, the learner must be able to

PRACTICAL SKILL ACTIVITY ELEMENT CODES	PRACTICAL SKILL ACTIVITY ELEMENTS
PA0301	Plan conduit routing and secure and support conduit
PA0302	Select fittings according to application and tighten all fittings
PA0303	Install above ground electrical wire-ways
PA0304	Install conduit bushings
PA0305	Install underground electrical wire-ways
PA0306	Remove sharp edges (deburr)

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0301	Wire-ways and their installation procedures
AK0302	Conduits and their installation procedures Internal Assessment Criteria

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0301	Wire-ways are installed according to procedure
IAC0302	Conduits are installed and secured according to procedure
IAC0303	Fittings are selected and tightened according to procedure

PM-07-PS04 INSTALL ELECTRICAL COMPONENTS	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given DC and AC combiners/junction boxes, disconnects, inverter, meter bases, and tools and equipment, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0401	Select location of DC disconnect
PA0402	Mount electrical enclosures
PA0403	Install DC and AC combiners
PA0404	Install PV system and inverter disconnects

PA0405	Install array wiring transition box
PA0406	Install inverter
PA0407	Install underground electrical components
PA0408	Install meter bases
PA0409	Label equipment
PA0410	Install junction boxes

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0401	Mounting and installation procedures for electrical components
AK0402	Locations for electrical components
AK0403	Labelling procedures for equipment

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0401	Electrical components are installed and/or mounted according to procedures
IAC0402	Equipment is labelled according to procedure
IAC0403	Safety requirements are adhered to

PM-07-PS05 INSTALL CIRCUIT CONDUCTORS	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given conductors, cables, inverter, modules, wire-ways, electrical testing instruments, and tools and equipment, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0501	Pull, label and terminate conductors
PA0502	Wire the inverter
PA0503	Wire modules
PA0504	Select the correct wire/cable type, colour, and gauge
PA0505	Secure conductors

PA0506	Measure wires/cables and wet up the wire/cable installation (tugger, fish tape, rope)
PA0507	Test conductor installation
PA0508	Test DC source circuits
PA0509	Test DC currents
PA0510	Set up pull stations
PA0511	Splice electrical conductors

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0501	Types of wires/cables and connections
AK0502	Procedures to wire modules and inverter
AK0503	Wire/cable type, colour, and gauge
AK0504	Procedures to pull, label, terminate and spice conductors
AK0505	Testing Procedures

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0501	Electrical components are installed and/or mounted according to procedures
IAC0502	Equipment is labelled according to procedure
IAC0503	Safety requirements are adhered to

PM-07-PS06 INSTALL SYSTEM INSTRUMENTATION	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given installed PV system, manufacturer's instructions and specifications, and tools and equipment, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0601	Test system
PA0602	Install power and energy metering

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0601	Metering
AK0602	Testing procedures

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0601	System is tested as per requirements
IAC0602	Power and energy metering is installed according to procedure
IAC0603	Safety requirements are adhered to

PM-07-PS07 INSTALL BATTERY COMPONENTS	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given battery bank, battery enclosure, cables, and tools and equipment, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0701	Test each unit before placement (voltage, specific gravity, polarity)
PA0702	Terminate fine stranded cables
PA0703	Install maintenance disconnect
PA0704	Confirm battery bank location
PA0705	Install battery enclosure
PA0706	Install battery enclosure venting
PA0707	Install battery spill containment
PA0708	Install batteries

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0701	Testing procedures
AK0702	Procedures to install batteries

AK0703	Procedures to install battery enclosure and battery spill containment

(e) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0701	Batteries are testing according to procedure
IAC0702	Battery enclosure, battery enclosure venting and battery spill containment are installed according to procedure
IAC0703	Batteries are installed according to procedure
IAC0704	Safety requirements are adhered to

3.2.2. Criteria for accreditation

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	Electrical and Solar PV environment, categories of tools and equipment in order for learners to be able to construct electrical and electronic circuits, Learning Management System (LMS) and Learning Management Information System, (LMIS)
CONSUMABLES	None

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• Relevant Level 5 qualification plus formal training in PV, or • A qualified PV Technician with at least 2 years of experience or • A qualified electrician/millwright with PV related training and/or 2 years‟ relevant experience working within a PV environment, or • Relevant accredited facilitation course with PV related formal training or experience
FACILITATOR/LEARNER RATIO	1:12

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	Compliance to the relevant occupational health, safety and environmental protection legislation

3.2.3 Exemptions

- None

3.2.4 121905-000-00-PM-10, Conduct and control project communication and stakeholder interaction, NQF Level 5, Credits 8

Practical Module (PM) – 04

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
121905-000-00-PM-10	Conduct and control project communication and stakeholder interaction	5	8	Face-to-Face

(a) Purpose of the Practical Skills Module:

The focus of the learning in this module is on providing the learner an opportunity to conduct and control stakeholder engagement.

(b) List of Practical Skill Activities:

PRACTICAL SKILL CODE	ACTIVITY TITLE
PM-10-PS01	Conduct project communication
PM-10-PS02	Identify, analyse and manage project stakeholder groups

(c) Scope of each Practical Skill Activity:

PM-10-PS01 CONDUCT PROJECT COMMUNICATION	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE:	
Given task instructions, stakeholder database, communication devices (e.g telephone/cellphone and relevant documentation, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0101	Develop a communication plan

(d) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0101	Communication plan meets the overall project scope and plan
IAC0102	The communication management plan matches the project information needs
IAC0103	An understanding of the impact and best practices of communication on the achievement of project delivery is described and motivated
IAC0104	A risk and an issue log is developed and scenario relevant mitigating actions recorded
IAC0105	The documented records of controlling project communication meets project, scenario, plan and scope
APPLIED KNOWLDEGE CODE	**APPLIED KNOWLEDGE**
AK0101	Communication tools, techniques and templates
AK0102	Communication plan requirements
AK0103	Types of information required to include in a project communication management plan
AK0104	Information management systems
AK0105	Communication requirement analysis

PM-10-PS02 IDENTIFY, ANALYSE AND MANAGE PROJECT STAKEHOLDER GROUPS	
PRACTICAL SKILL ACTIVITY SCOPE OUTLINE	
Given task instructions, stakeholder database, communication devices (e.g telephone/cellphone and relevant documentation, the learner must be able to:	
PRACTICAL SKILL ACTIVITY ELEMENT CODES	**PRACTICAL SKILL ACTIVITY ELEMENTS**
PA0201	Utilise the stakeholder database
PA0202	Apply methods and techniques to engage stakeholders effectively

(d) Applied Knowledge that underpins the Practical Skill

APPLIED KNOWLDEGE CODE	APPLIED KNOWLEDGE
AK0201	Stakeholder analysis reports
AK0202	Identification of stakeholders

AK0202	Techniques to engage stakeholders

(d) Internal Assessment Criteria (IAC)

IAC CODE	IAC DESCRIPTION
IAC0201	Implementation requirements and practices of the stakeholder management plan can be explained
IAC0202	The process for evaluating the impact and influence of each stakeholder can be explained

3.1.2 Criteria for accreditation

Physical Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
EQUIPMENT & TOOLS	Access to a Workshop/Plant, Learning Materials, Training Venue, tables, chairs, whiteboard, Flipchart Stand and Flipcharts, access to computer/Laptop, access to the Internet, relevant software
CONSUMABLES	None

Human Resource Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	Facilitators of learning who has subject matter expertise in project management as covered by this module Facilitators who has achieved a nationally accepted standard in the delivery of occupational learning Facilitators of learning who has achieved a recognised learning standard in assessment practice
FACILITATOR/LEARNER RATIO	1:12

Legal Requirements:

SKILLS DEVELOPMENT PROVIDER (SDP)	
QUALIFICATIONS & EXPERIENCE	• Compliant with Occupational Health and Safety Act

3.1.3 Exemptions

- None

3.3 POSSIBLE SEQUENCING AND INTEGRATION

ORDER	MODULE TITLE	MODULE CODE	LEVEL	CREDITS
1.	Components of PV systems	313109-001-00-KM-08	4	20
2.	Use tools, measuring instruments and equipment	313109-002-00-PM-03	4	7
3.	Install the mechanical components of a PV system	313109-001-00-PM-06	4	10
4	Install the electrical components of a PV system and inter-connect the system,	313109-001-00-PM-07	4	15
5.	Conduct and control project communication and stakeholder interaction	121905-000-00-PM-10	5	8