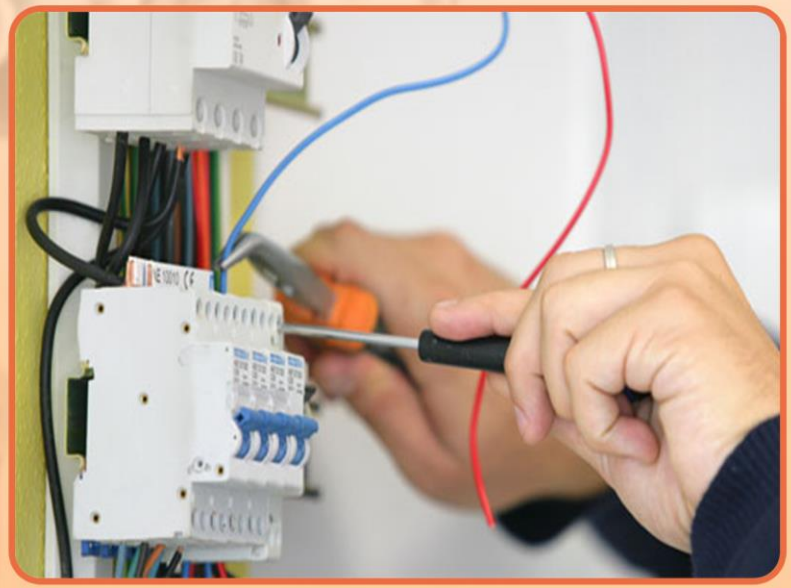
National Vocational Certificate

Level 3 in

Electrical Technology (Building Electricity)

Competency Standards



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Competency Standards: Building Electrician cum PV Cell Installer - Level 3

Competency Standard A: Apply knowledge of entrepreneurial ideas

Overview: This competency standard is intended to assist people in applying knowledge of entrepreneurial ideas and qualities. People holding credit for this competency standard are able to: Demonstrate knowledge of the requirements of entrepreneurs; conduct business start-up activities; develop a financial strategy; develop a marketing strategy; and implement and control business financial strategy

Competency Unit	Performance Criteria	Knowledge and Understanding
A1: **Demonstrate knowledge of the requirements of entrepreneurs**	**P1-** Identify the importance of entrepreneurs for Pakistan **P2-** Identify challenges of being an entrepreneur **P3-** Confirm and implement strategies for improving personal entrepreneurship qualities	**K1-** Types of verbal and non-verbal messages **K2-** Requirements and benefits of becoming an entrepreneur **K3-** Features of personal entrepreneurial assessment tools
A2: **Conduct business start-up activities**	**P1-** Select and secure business premises **P2-** Secure business operating clearance **P3-** Secure business support service	**K1-** Business premises requirements • Size • Location • Cost **K2-** Municipal guidelines and regulations **K3-** Application procedures
A3: **Develop a financial strategy**	**P1-** Estimate total cost of set up **P2-** Identify sources of funding **P3-** Estimate business expenses **P4-** Project profit and loss and cash flow **P5-** Establish and follow bank requirements	**K1-** Estimation and calculation **K2-** Conditions for funding **K3-** Basic accounting principles **K4-** Basic accounting principles **K5-** General bank requirements

A4: **Develop a marketing strategy**	**P1-** Identify potential profitable opportunities and targetidentify customers in markets **P2:** Plan service and product delivery **P3:** Identify potential joint venture partners operating in the industry **P4:** Identify methods of promotion	**K1-** Estimation and calculation **K2-** Customer expectations and satisfaction **K3-** Principles of a competitive market **K4-** Basic promotional and/or marketing concepts
A5: **Implement and control business financial strategy**	**P1-** Implement financial control system **P2-** Prepare financial statements and interpret results **P3-** Prepare and implement periodic plans and budgets **P4-** Maintain business cash and general liquidity	**K1-** Basic financial concepts **K2-** Basic financial concepts **K3-** Basic financial concepts **K4-** Basic financial concepts

Competency Standard B: Plan work and calculate cost

Overview: This competency standard is intended for skilled people in paid employment. People holding credit for this competency standard are able to: Interpret drawings, sketches and specifications; produce drawings and sketches; calculate material and labour cost.

Competency Unit	Performance Criteria	Knowledge and Understanding
B1: **Interpret drawings, sketches and specifications**	**P1-** Identify and obtain safety and other regulatory requirements as per job requirement *** lay out caon only be confirmed when cost requirements on site are clear** **P2-** Interpret and confirm layout plan with on site requirements **P3-** Identify distribution points	**K1-** Safety requirements; Specifications; Hazard identification **K2-** Drawings and symbols specifications **K3-** Drawings and symbols specifications
B2: **Produce drawings and sketches**	**P1-** Produce basic technical drawing and sketch **P2-** Dimension drawing and sketch correctly **P3-** Scale drawing and sketch	**K1-** Drawings and symbols specifications **K2-** Drawings and symbols specifications **K3-** Drawings and symbols specifications
B3: **Calculate material and labour cost**	**P1-** Identify location for installation **P2-** Estimate material requirements derived from produced drawing or sketch **P3-** Estimate labour cost for installation **P4-** Produce estimate of overall cost	**K1-** Location requirements **K2-** Estimation and calculation methods **K3-** Estimation and calculation methods **K4-** Estimation and calculation methods

Competency Standard C: Install three-phase wiring

Overview: This competency standard is intended for those who carry out electrical operations. People holding credit for this competency standard are able to: Plan wiring layout; lay cable; perform wiring test; and complete work.

Competency Unit	Performance Criteria	Knowledge and Understanding
C1: **Plan wiring layout**	**P1-** Draw wiring layout **P2-** Measure distance to connection points **P3-** Estimate material in meters, lenght **P4-** Prepare tools, equipment and materials **P5-** Size cable diameter (mm^2)	**K1-** Interpretation of drawings, symbols, cable number according to load, and colour coding **K2-** Measuring of units and conversion **K3-** Quality of different conductor and insulator types **K4-** Application of tools, equipment and materials
C2: **Lay cables**	**P1-** Prepare installation of cable **P2-** Install conduit, GI pipes, PVC pipes and/or ducts **P3-** Pull-in cables **P4-** Connect cables **P5-** Connect fixtures	**K1-** Chiselling, ducting, PVC and GI pipe wiring procedures **K2-** Properties of materials **K3-** Application of cables and tools **K4-** Types of joints **K5-** Types and purpose of fixtures
C3: **Perform wiring test**	**P1-** Inspect wiring and distribution board **P2-** Conduct tests **P3-** Document test results **P4-** Understand & implement, safety requirements	**K1-** Importance of continuity and factors of loose fittings **K2-** Application of equipment and tools used for testing; Importance of earthing **K3-** Importance of documenting compliance & noncompliance of test results and subsequent steps to be taken
C4: **Complete work**	**P1-** Complete work related documents and procedures when testing and commissioning **P2-** Perform final quality inspection **P3-** Clean up and store tools, equipment and materials	**K1-** Importance of documentation; Customer care procedures and techniques **K2-** Importance of quality; handing over to client **K3-** Waste disposal procedures; Care of tools and equipment

Competency Standard D: Perform distribution of electrical supply

Overview: This competency standard is intended for those who carry out electrical operations. People holding credit for this competency standard are able to: review electrical load schedule, set distribution priority, monitor electrical load.

Competency Unit	Performance Criteria	Knowledge and Understanding
D1: **Review electrical load schedule**	**P1**- Check layout plan **P2-** Check input & output voltages **P3-** Check voltage drops **P4- U**nderstand Load requirements	**K1-** Interpretation of drawings, symbols, cable number, colour coding and electrical load schedule **K2-** Maintenance of input and output voltages **K3-** Methods of calculation of voltage drops, overloading and load balance
D2: **Set distribution priority**	**P1-** Review distribution priority plan **P2-** Reschedule electrical load as per distribution priority	**K1-** Interpretation of distribution priority plan **K2-** Methods of rescheduling of electrical loads
D3: **Monitor electrical load**	**P1-** Monitor electrical load (current) **P2-** Monitor power consumption (energy) **P3-** Monitor voltage drops **P4-** Perform logout/tag out	**K1-** Methods of current measurement (Amperes) **K2-** Methods of energy measurement in (KWH) **K3-** Methods of voltage drop measurement (Volt) **K4-** Methods of log out / tag out and labelling **K5-** should be able to understand values readings, graphs from remote monitoring discuss

Competency Standard E: Perform corrective maintenance as part of electrical operations

Overview: This competency standard is intended for those who carry out electrical operations. People holding credit for this competency standard are able to: Plan and prepare for corrective maintenance; perform troubleshooting; carry out corrective maintenance procedures; and complete work.

Competency Unit	Performance Criteria	Knowledge and Understanding
E1: **Plan and prepare for corrective maintenance**	**P1-** Identify and obtain safety and other regulatory requirements for maintenance **P2-** Interpret circuit diagrams **P3-** Identify and select tools and equipment	**K1-** Safety requirements; Specifications; Hazard identification **K2-** Drawings and symbols specifications **K3-** Tools and equipment and calibration thereof
E2: **Perform troubleshooting**	**P1-** Check for safety hazards **P2-** Carry out diagnostic procedures **P3-** Identify faulty parts and/or equipment **P4-** Analyse system fault	**K1-** Troubleshooting requirements **K2-** Identification of electrical faults by checking shape, size and colour of components and parts; Measurement of electrical parameters; Safety precautions **K3-** Methods of fault identification in electrical components **K4-** System operations in an electrical environment
E3: **Carry out corrective maintenance procedures**	**P1-** Dismantle faulty parts or components **P2-** Replace or repair faulty parts or components **P3-** Perform commissioning	**K1-** Dismantling procedures **K2-** Replacing and repairing procedures **K3-** Electrical load management; commissioning procedures
E4: **Complete work**	**P1-** Complete work related documents and procedures **P2-** Perform final quality inspection **P3-** Clean up and store tools, equipment and materials	**K1-** Importance of documentation; Customer care procedures and techniques **K2-** Importance of quality; handing over to client **K3-** Waste disposal procedures; Care of tools and equipment

Competency Standard F: Designing and installation of off-grid solar PV systems

Overview: This competency standard is intended for those who carry out Installation of off-grid solar PV system. People holding credit for this module are able to describe Designing (software tools) and off-grid solar PV systems

Competency Unit	Performance Criteria	Knowledge and Understanding
A1: **Designing (software tools)**	**P1-** Use software for system sizing **P2-** Use of software in selection of solar system	**K1-** Software techniques ,skills , guidelines , graphs and reports **K2-** Electrical system, renewable energy system, planning and design software, energy usage, system performance, solar characteristics, usage profiles, generation, load storage calculations, on-grid and off-grid, residential, commercial, system sizing, utility rate plans, rate comparison, utility costs and energy savings
A2: **Installation of off-grid solar PV systems**	**P1-** Follow safety and other regulatory requirements for Domestic Solar Water Heating System. **P2-** Draw off-grid solar PV systems Layout **P3-** Identify and select tools and equipment for installation **P4-** Install solar array **P5-**Join solar plates and connections **P6-**Perform installation	**K1-** Safety requirements and hazards identifications **K2-** Drawing and symbol specifications **K3-** Tools and equipment for Commissioning, Operation and Maintenance **K4-** Installation procedures **K5-** Jointing techniques ,methods of connections and specification requirements

Documents, policies, guidelines:

- International Labour Organisation (ILO) Standards on Occupational Health and Safety
- Pakistan Electricity Act, 1910 and subsequent amendments
- Institute of Electrical and Electronics Engineers Standards Association (IEEE-SA)
- Industry code of practice

Tools and Equipment:

No.	Description	Quantity
1	Personal protective equipment	
2	Fire extinguishers	
3	**First aid box**	
4	Adjustable wrench	
5	Amp meter	
6	AVO meter	
7	Batteries	
8	Battery charger	
9	Bench vice	
10	Ceiling hole cutter	
11	Charge controller	
12	Chisel	
13	Clamp on meter	
14	Compass	

15	Cutter	
16	Drill machine	
17	Earth tester meter	
18	Extension board	
19	File set	
20	First Aid box	
21	Gloves	
22	Goggles	
23	Grinder	
24	Hammer	
25	Hand drill machine	
26	Helmet	
27	Herts meter	
28	Hexsaw	
29	Knife (cable)	
30	Level	

31	L-key set	
32	Lock plier	
33	Measuring tape	
34	Megger meter (Analog & Digital)	
35	Micrometer	
36	Multimeter	
37	Number punch	
38	Phase sequence meter	
39	Pipe cutter	
40	Pipe vice	
41	Pipe wrench	
42	Plier set	
43	Punching tool (Networking /Telephone)	
44	Rachet set	
45	Safety boots	
46	Scissor	
47	Screw driver set	
48	Soldering iron	
49	Spanner set	
50	Steel scale	

51	Steel wire	
52	synchronizing meter	
53	Tachometer	
54	Tester	
55	Thimble press	
56	Tong tester (clamp-on meter) AC/DC	
57	Torch	
58	Vernier caliper	
59	Volt meter	
60	Wire gauge	
61	Wood saw	

Consumables:

No.	Description	Quantity
1	Cable 3 / .029”	As Required
2	Cable 7 / .029”	As Required
3	Cable 1 / .036”	As Required
4	Cable 23 / .0076”	As Required
5	Cable 40 / .0076”	As Required
6	Switch Single Way	As Required
7	Switch Two Way	As Required
8	Push Button	As Required
9	Bulb Holder Piano Type	As Required
10	Bulb Holder Button Type	As Required
11	Ceiling Rose	As Required
12	Fan Dimmer	As Required
13	Socket Two Pin	As Required
14	Socket Three Pin	As Required
15	Light Plug	As Required
16	Power Plug	As Required
17	PVC Pipe	As Required
18	PVC Elbow	As Required
19	PVC Band	As Required

20	Junction Box	As Required
21	Fan Box	As Required
22	Raval Plug	As Required
23	Pipe Shaddle	As Required
24	Cable Shaddle	As Required
25	Board 4 x 4	As Required
26	Board 7 x 4	As Required
27	Board 8 x 10	As Required
28	TV Pin	As Required
29	Telephone Pin	As Required
30	Insolation Tape	As Required
31	PVC Duct Plain 3/4”	As Required
32	PVC Duct Slotted 1”	As Required
33	PVC Duct Plain 3/4”	As Required
34	PVC Duct Slotted 1”	As Required
35	Fuse Piano Type	As Required
36	Main Switch	As Required
37	Breaker Single Poll	As Required
38	Breaker Double Poll	As Required
39	Volt meter Panel	As Required
40	Ampere Meter Panel	As Required

41	DB Box	As Required
42	DB Switch	As Required
43	PG Connector	As Required
44	Neutral Terminal	As Required
45	Screw Different Size	As Required
46	Steel Nail Different Size	As Required
47	Blub 100 Watt	As Required
48	Bulb 200 Watt	As Required
49	Nut Bolt Different Size	As Required
50	Electric Bell	As Required
51	Two Pin Shoe	As Required
52	Three Pin Shoe	As Required
53	Cable Tube Connection	As Required
54	Tube Rod	As Required
55	Choke 20w, 40w	As Required
56	Tube Starter	As Required
57	Choke Patti Fitting	As Required
58	Winding Wire Different Size	As Required
59	Slat Paper Different Size	As Required
60	Cotton Tape	As Required

61	Sleeve Different Size	As Required
62	Varnish	As Required
63	Cable Three Core 40/ .0076	As Required
64	Cable Four Core 7/ .036	As Required
65	Cable Three Core 7/ .029	As Required
66	Connection Plate	As Required
67	Clutch Plate	As Required
68	Breaker Fitting Patti (Din Ray)	As Required
69	Relay 12V, 5A	As Required
70	Resistor Different Types	As Required
71	Transistor Different Types	As Required
72	LED	As Required
73	Diode	As Required
74	Rectifier Bridge	As Required
75	Carbon Brush	As Required
76	Battery 6v	As Required
77	Breaker Stripe	As Required
78	Flout Switch	As Required
79	Magnetic Connector	As Required
80	Cut Out	As Required

81	Breaker Cartridge Fuse	As Required
82	ON / OFF Push Button	As Required
83	Timer	As Required
84	Relay AC – 220V	As Required
85	Relay DC- 12V	As Required
86	Selector Switch Volt Meter	As Required
87	Selector Switch Ampere Meter	As Required
88	Emergency Switch	As Required
89	Soldering Wire	As Required
90	Paste	As Required
91	Light Indicator	As Required
92	Limit Switch (MEM Inter Locking)	As Required
93	Motor Driven Selector Switch (Water Tank)	As Required
94	Speaker	As Required
95	Acid	As Required
96	Hydro Metter	As Required
97	Multi Metter (Analogue / Digital)	As Required
98	Cam Starter (single phase & three phase)	As Required
99	Generator Switch	As Required
100	Star Delta Manual	As Required

101	Capacitor Different Size	As Required
102	Intercom Bell	As Required
103	Over Load Relay	As Required
104	Forward Reverse Switch	As Required
105	Tai Different Size	As Required
106	Magnetic Connector	As Required
107	Current Transformer	As Required
108	8 Pin type & 11 Pin type relay with base	As Required
109	Timer Circuit	As Required
110	Relay Circuit	As Required
111	Boben Transformer	As Required
112	Core Transformer	As Required
113	Coal	As Required
114	Calcium Carbonate	As Required
115	Petrol	As Required
116	Heat Sleeve Tube	As Required
117	Changer Over Switch	As Required
118	Timer 0-60 second	As Required
119	Time 1-6 minute	As Required
120	Babon 1 ¼”, 1 ½”, 2”, 2x3”	As Required
121	UPS Card	As Required

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