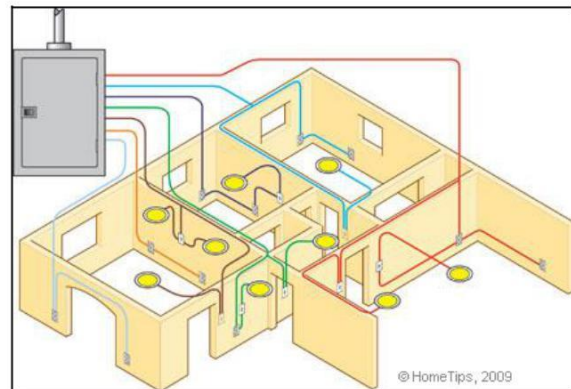
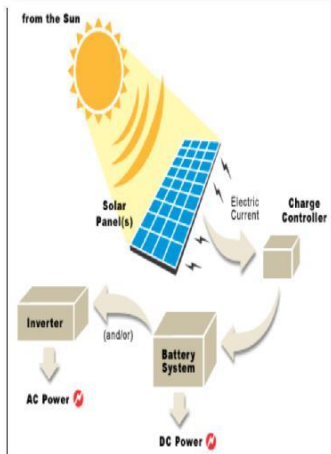




National Vocational Certificate level 1-4, in (Electrical Technology)

“Building Electrician - Solar PV System Technician” RPL CHECKLIST FOR ASSESSORS & MODERATORS



**National Vocational and Technical Training Commission
(NAVTTTC) Government of Pakistan**



SUMMARY OF ASSESSMENT IN RPL

Competency Standard	Required Minimum Evidence	Assessment decision	Gap training	Re-assessment Decision
A	Conduct site assessment for solar PV system installation			
B	Develop basic Solar PV System design			
C	Interpret job document			
D	Install Solar PV System			
E	Perform wiring of Solar PV System			
F	Troubleshoot Solar PV system			
G	Maintain Solar PV system			
H	Adopt safety precautions			
I	Develop basic professional skills			



Competency Standard A: Conduct site assessment for solar PV system Installation

Competency Units	Performance Criteria	YES	NO	COMMENTS
A1: Carryout load assessment	P1. Determine nature of load P2. Identify rating of load P3. Measure running load P4. Calculate the load			
A2: Perform shadow analysis	P1. Conduct physical visit of the site P2. Identify path of the shadow P3. Use shadow detector P4. Enquire about future developmental prospects			
A3. Estimate wiring requirements	P1. Observe existing condition of wiring(If needed) P2. Workout length of the wire P3. Select appropriate size of the wire P4. Select appropriate type of the wire P5. Figure out required safety and control devices			
A4. Identify the south direction for mounting structure	P1. Observe the location P2. Point out south direction by using compass			

Competency Standard B: Develop basic Solar PV System design

Competency Units	Performance Criteria	YES	NO	COMMENTS
B1. Calculate load for solar PV system design	P1. Enlist the No. of appliances P2. Measure the PV system load P3. Calculate the PV system load P4. Record the PV system load			
B2. Assess working schedule of load	P1. Inquire the load duty hours from customer P2. Determine the peak load hours P3. Observe peak sun hours			
B3. Select Panels	P1. Select the type of PV panel P2. Determine the capacity of PV solar panel P3. Select number of PV solar panel			
B4. Determine backup time	P1. Estimate the required backup time of load P2. Estimate the capacity of battery bank P3. Select the types of batteries for backup			
B5. Draw basic design of solar PV System	P1. Workout capacities of devices P2. Sketch a diagram as per requirements P3. Get the design approve by the client			

Competency Standard C: Interpret job document

Competency Units	Performance Criteria	YES	NO	COMMENTS
C1. Prepare checklist for job	P1. Prepare list of material required P2. Prepare list of tools required P3. Prepare list of equipment required			
C2. Interpret schematic diagram	P1. Read schematic diagram of wiring P2. Read schematic diagram of civil work P3. Read schematic diagram of mechanical work			
C3. Record the data	P1. Collect the data P2. Enlist the data P3. Prepare report			
C4. Prepare log sheet for general maintenance	P1. Prepare schedule of routine maintenance P2. Identify the activities for conducting routine maintenance P3. Prepare list of tools for routine maintenance			

Competency Standard D: Install Solar PV System

Competency Units	Performance Criteria	YES	NO	COMMENTS
D1. Arrange required tools and equipment	P1. Collect the required tools and equipment P2. Check physical status of tools and equipment P3. Perform transportation of tools and equipment P4. Manage safe storing of tools and equipment			
D2. Perform PV test	P1. Conduct short circuit current test P2. Conduct open circuit voltage test			
D3. Erect the mounting structure	P1. Assemble the structure parts P2. Fix mounting structure P3. Adjust angles of the mounting structure			
D4. Fix PV modules as per circuit design	P1. Install PV module on the mounting structure P2. Verify angle of the PV module with the help of angle finder/meter P3. Ensure shadow overlapping			
D5. Install Battery Bank	P1. Arrange batteries with accessories as per requirements P2. Fix battery bank in the racks P3. Make parallel series strings for batteries, as per circuit design			

<p>D6. Install inverter / charge Controller / variable frequency drive (VFD)</p>	<p>P1. Arrange inverter and charge controller in variable frequency drive (VFD) P2. Fix inverter and charge controller in variable frequency drive (VFD) P3. Ensure fixation as per circuit design</p>			
<p>D7. Install Solar PV Pumps</p>	<p>P1. Arrange Solar pumps as per desired capacity P2. Fix Solar pumps P3. Ensure fixation of Solar pumps as per circuit design</p>			
<p>D8. Connect the PV modules as per circuit design</p>	<p>P1. Make strings as per circuit design P2. Make arrays as per circuit diagrams P3. Connect arrays with junction boxes</p>			

Competency Standard E: Perform wiring of Solar PV System

Competency Units	Performance Criteria	YES	NO	COMMENTS
E1: Interpret wiring diagram	<p>P1. Collect the wiring diagram and layout from job documents</p> <p>P2. Identify paths and marking for wiring</p>			
E2: Connect the PV modules as per circuit diagram	<p>P1. Interconnect the strings to make arrays</p> <p>P2. Insulate all the arrays as per standard</p> <p>P3. Combine all the arrays through combiner box</p>			
E3: Lay Cables	<p>P1. Install conduits for cables</p> <p>P2. Lay cables through the conduits</p> <p>P3. Connect the cables to the control and safety boxes</p>			
E4. Perform wiring test	<p>P1. Perform continuity test</p> <p>P2. Perform polarity test</p> <p>P3. Perform earth test</p>			
E5. Carry out battery test	<p>P1. Perform specific gravity test</p> <p>P2. Perform internal short circuit test</p> <p>P3. Perform terminal voltage test</p> <p>P4. Check terminal for carbon contents</p> <p>P5. Perform battery bank polarity test</p>			
E6: Interconnect the PV system	<p>P1. Connect the battery bank to the inverter / charge controller through safety circuits</p> <p>P2. Connect the PV modules to the inverters /</p>			

	<p>controllers through safety circuits</p> <p>P3. Connect the inverter with the input A.C source</p> <p>P4. Connect the load to the inverter through safety circuit</p>			
<p>E7: Configure the inverter / charge controller</p>	<p>P1. Interpret the inverter manual</p> <p>P2. Inquire the customers / site requirements</p> <p>P3. Set the parameters as per requirement</p>			

Competency Standard F: Troubleshoot Solar PV system

Competency Units	Performance Criteria	YES	NO	COMMENTS
F1: Diagnose the fault	P1. Check inverter for fault code P2. Verify safety circuits P3. Check status of wiring P4. Verify status of battery P5. Check status of PV Panels P6. Identify nature of the fault (Hardware or software) P7. Diagnose the cause of fault P8. Document the fault			
F4: Identify solution of the faults	P1. Trace out solution of fault code with the help of manual P2. Estimate cost of rectification P3. Report the fault to the concerned persons			
F5: Rectify the faults	P1. Reset the software for rectification P2. Arrange the required tools and equipment P3. Repair faulty component / equipment P4. Replace faulty component / equipment P5. Refer irreparable / un-replaceable faults to the concerned lab			
F6. Carryout post rectification function test	P1. Re connect the system with the load P2. Verify function of the system on full load P3. Document the services as per instructions P4. Clean and pack the store as per sop			
F7. Perform wiring tests	P1. Perform continuity test P2. Perform polarity test P3. Perform earth test P4. Rectify the problem			

Competency Standard G: Maintain Solar PV system

Competency Units	Performance Criteria	YES	NO	COMMENTS
G1. Prepare check list for maintenance	<p>P1. Prepare list of tools and instruments for maintenance</p> <p>P2. Prepare list of materials for maintenance</p> <p>P3. Prepare list of activities for maintenance</p>			
G2. Follow routine maintenance log sheet	<p>P1. Collect maintenance log sheet</p> <p>P2. Arrange required tools / instruments for maintenance</p> <p>P3. Perform activities as per schedule</p> <p>P4. Place equipment after maintenance as per SOP</p>			
G3. Maintain Solar PV modules	<p>P1. Arrange cleaning materials</p> <p>P2. Wash the panels as per instructions (Avoid washing during peak sun hours).</p> <p>P3. Check connections and joints of solar PV modules</p> <p>P4. Check the physical and mechanical health of modules as per standard</p> <p>P5. Adjust the seasonal tilt angle</p>			

		YES	NO	COMMENT
G4. Maintain inverter / Charge controller / Protection circuits	P1. Arrange servicing equipment P2. Check the status of cooling fans P3. Check input output terminals of invertors P4. Perform servicing with electrical blower P5. Maintain connection status as per standards			
G5. Maintain battery bank	P1. Clean terminals of battery with sand paper P2. Maintain level of electrolytes P3. Maintain gravity of electrolytes P4. Maintain battery connections P5. Apply grease to terminal to avoid corrosion / sulphation P6. Verify the operations of battery bank			
G6. Perform post verification Function of the system	P1. Switch on the system P2. Observe display reading of inverter / charge controller P3. Perform full load test P4. Prepare the report of maintenance activities performed			

Competency Standard H: Adopt safety precautions

Competency Units	Performance Criteria	YES	NO	COMMENTS
H1. Ensure Personal safety	<p>P1. Arrange PPEs as per requirements</p> <p>P2. Wear proper PPE as per nature of job</p> <p>P3. Store PPEs at appropriate place after use</p> <p>P4. Ensure availability of first aid box</p>			
H2. Ensure workplace safety.	<p>P1. Ensure cleaning of workplace properly</p> <p>P2. Avoid hazardous (electric / chemical) by adopting safety precautions</p> <p>P3. Ensure availability of emergency exit</p> <p>P4. Ensure lighting and ventilation</p> <p>P5. Ensure availability of Firefighting equipment</p> <p>P6. Report to the concerned immediately in case of emergency</p> <p>P7. Ensure safe access to the system</p>			
H3. Ensure safety of tools and equipment	<p>P1. Ensure insulation of tools and equipment</p> <p>P2. Store safely tools and equipment</p> <p>P3. Clean tools on a regular basis as per schedule</p>			

Competency Standard I: Develop basic professional skills

Competency Units	Performance Criteria	YES	NO	COMMENTS
<p>I1. Develop basic computer operating skills</p>	<p>P1. Perform Microsoft basic commands in MS word</p> <ul style="list-style-type: none"> a. Open File b. Format a file <ul style="list-style-type: none"> i. Font (Type/size/bold/Italic) ii. Header Footer iii. Page number iv. Insert pics/table/hyperlink c. Save a File d. Save a folder <p>P2. Perform basic commands in Microsoft MS Excel</p> <ul style="list-style-type: none"> a. Open a worksheet b. Sum functions c. If functions d. Basic calculations e. Table and graphs f. Save a worksheet/folder 			

		YES	NO	comments
	<p>P3. Prepare Microsoft power point presentation by using basic commands</p> <p>P4. Perform browsing on the internet as per needs</p> <p>P5. Perform research online on new trends in the market with the help of internet</p>			
12. Develop basic communication skills.	<p>P1. Negotiate with a client to understand the demand</p> <p>P2. Plan product supply as per clients requirements</p> <p>P3. Set price(s) according to clients requirements</p> <p>P4. Communicate the plan to the client</p> <p>P5. Take feedback from client on understanding of the exact job with timeline and cost</p>			
13. Develop basic marketing skills	<p>P1. Present a design to the client as per requirement</p> <p>P2. Finalize the business deal</p> <p>P3. Purchase the equipment/tools and consumables as per agreed design</p> <p>P4. Adopt correct means of transportation</p> <p>P5. Select promotional means, according to target needs of clients</p>			
14. Identify needs of the market.	<p>P1. Analyse upcoming market trends.</p> <p>P2. Develop Professional network.</p> <p>P3. Demonstrate behavioural skills.</p> <p>P4. Develop sound interpersonal skills</p> <p>P5. Develop new designs.</p>			
15. Follow Environmental, Health and Safety standard	<p>P1. Follow Health and Safety Rules</p>			
	<p>P2. Ensure environmental safety</p> <p>P3. Ensure compliance of net metering policy</p> <p>P4. Ensure workplace safety by following safety standards</p> <p>P5. Ensure safety while operating</p>			

	wires and electricity. P6. Store all tools and equipment properly in a safe area.		
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