# National Occupational Skill Standard (NOSS)

Occupational Title : Solar Electric Technician

Level :1

Sector : Renewable Energy Engineering

Sub - Sector : Solar Photovoltaic (PV)

NOSS ID/NSCO ID :

ISCO NO :



Council for Technical Education and Vocational Training

#### NATIONAL SKILL TESTING BOARD

Madhyapur Thimi-17, Sanothimi, Bhaktapur, Nepal

Developed: 06-11-2023 (20-07-2080)



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6.	Mr. Bimal Ghimire	Member	Project Manager, Lotus Energy.
7.	Mr. Pradeep Pant	Guest – expert	Electrical Engineer Lotus Energy (P.) Ltd.
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Approved by the Tripartite National Skill Testing Board July 1998 (2054/055)





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### Approved by the Tripartite National Skill Testing Board. July 2009 (2065/066)



NOSS ID: #



#### The National Skill Standard and Test was Revised by: Designation No. Name

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Recommended by Renewable Energy Technical Sub Committee: 2015 March (2071 Chaitra)



NOSS ID: #



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Recommended by Renewable Energy Technical Sub Committee: 06 November 2023 (20 Kartik 2080)





1	Occupational Title: Solar Electric Technician Level: 1
2	Job Description:
	Solar Electric Technician, L-1 installs off-grid solar PV system upto 2kWp, installs single phase on-grid solar PV system upto 5kWp, installs solar water pump upto 1500 W and installs solar street light.
3	UNITS OF COMPETENCY:
	1. Install off-grid solar PV system upto 2kWp
	2. Install single phase on-grid solar PV system upto 5 kWp
	3. Install solar water pump upto 1500 W
	4. Install solar street light
	5. Perform communication
	6. Develop professionalism
	*Note: Units 5 and 6 are not for testing purpose.
4	Qualifying Notes/Prerequisites:
7	Physical Requirements: Sound health
	Entry Requirements: As per NSTB rules
	Additional Information:
	Assessment Types: Performance test only
	Assessment Duration: 2:00 to 4:00 hours (Single Competency)
	4:00 to 6:00 hours (Full Competency)  Recommended Group Size: 6 to 8 candidates
	7 CIEVY
	NOSS ID: # Developed Date: 2023-11-06 Revision Number: ## Revised Date: dd/mm/yy Page:6





5	Unit No: 1 Unit Title: Install off-grid solar PV system upto 2 kV	Vр	Unit code:				
	Elements of competency		Per	formance standards			
		1.1.1	ersonal Protective Equipment	(PPE) used in accordance with task requirement.			
	1.1 Prepare tool, equipment and materials	1.1.2	ools, equipment and materials	collected as per task requirement.			
		1.1.3	Vorking condition of tools and e	equipment checked and fault tagged.			
		1.2.1	olar installation area determine	ed in consultation with client or as per drawing.			
			<i>ite assessment</i> conducted at pe	eak sun hours for solar installation.			
	1.2 Perform site assessment	1.2.3	olar installation area verified as	s per the drawing and layout for installation.			
		1.2.4	.4 Feedback is provided based on-site assessment.				
		1.3.1	<b>Nounting structure</b> installed fire	mly in line and level ensuring to withstand wind			
			ressure.				
		1.3.2	Components of solar PV system	verified and checked for physical damage.			
		1.3.3	pen circuit voltage and short ci	rcuit current measured of each module and verified			
			vith manufacturer's specificatio	n.			
	1.3 Install PV module/array/string	1.3.4	olar PV module(s)/array/string	installed firmly on mounting structure in required			
			irection and inclination as per o	drawing.			
		1.3.5	V module (s) connected in serie	es or parallel as per system design to junction/combiner			
			ox along with wire conduit.				
		1.3.6	onduit installed and cables laid	from junction/combiner box to charge			
			ontroller/inverter through prot	ection devices.			





1.4 Install charge controller	<ul><li>1.4.1 Location for charge controller identified in consultation with client.</li><li>1.4.2 Charge controller fixed firmly on designated area.</li></ul>
1.4 Install charge controller	1.4.2 Charge controller fixed firmly on designated area.
1.4 Install charge controller	
	1.4.3 Positive and negative terminals of solar PV module(s)/array/string connected to
	corresponding terminals of charge controller through protection devices.
	1.4.4 Charge controller connected to DC loads.
	1.5.1 Specific gravity and voltage of battery measured and verified as per manufacturer's
	specification.
	1.5.2 Batteries placed in well-ventilated area with or without rack.
	1.5.3 Batteries connected in series or parallel as per wiring diagram.
	1.5.4 Positive and negative terminals of charge controller connected to corresponding
1.5 Install battery bank and solar inverter	terminals of batter bank/pack through protection devices.
	1.5.5 Inverter firmly fixed on identified location.
	1.5.6 Positive and negative terminals of battery bank connected to corresponding terminal
	of inverter through protection devices.
	1.5.7 Inverter connected to AC loads.
	1.6.1 Conduit fixed along marked route.
	1.6.2 AC/DC cables laid through conduit as per specification.
1.6 Perform electrical wiring	1.6.3 Junction box mounted at shortest distance between charge controller and DC load of
<b>6</b>	building.
	1.6.4 AC/DC wires connected to power sockets and loads as per wiring diagram.
1.7 Install earthing and protection devices	1.7.1 Earthing components checked and assembled as per manufacturer's instruction.



	1.7.2 Earthing with lightning arrestor installed as per drawing.
	1.7.3 Earthing system connected with solar PV system as per drawing.
	1.7.4 <i>Protection devices</i> fixed in line and level in designated area.
	1.7.5 Protection devices connected with solar PV system as per wiring diagram.
	1.8.1 Solar PV system and individual components functionality checked as per system design.
	1.8.2 Issues faced during installation rectified.
1.8 Test solar PV system	1.8.3 Solar PV system activated as per commissioning procedures.
	1.8.4 Client oriented on operation, maintenance and cleaning of solar PV system.
	1.9.1 Tools and equipment cleaned and stored in designated location.
1.9 Clean workplace	1.9.2 Unused and leftover materials collected and stored in designated location.
	1.9.3 Workplace cleaned and waste disposed as per <i>3R's principle</i> at designated location.

#### Task Performance Requirements (Tools, Equipment and Materials):

• Solar PV module(s), connecting cables (UV Protective), support structure, controller unit, battery, solar inverter, Pyranometer, magnetic compass, multi-contact (MC) connector, hammer, screw drivers, pliers, chisel, adjustable wrench, spanners, hacksaw, knife, wire cutters, crimping tools, wire strippers, angle meter/set square, measuring tape, level meter, drill machine, battery operated drill machine, hot air gun blower, IR Thermometer, multimeter, clamp on meter, megger, cables/wires, hydrometer, thermocouple, cable clips, set of nuts and bolts, cable lug, , heat shrink tube, drift, funnel, plumb bob, elbow, T-jointer, power socket, switches, junction box, bus bar, marker, connectors, screws, clips, rack, cable tie, conduit, corrugated conduit, PVC tape, petroleum jelly/grease, lightning arrestor, Earth Electrodes, Earthing Strip, Earth pit, back fill compound, Earth hole drilling machine, protection devices, dust bin, dust pan, broom, first aid kit and Personal protective equipment (PPE).



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### 7 Safety and Hygiene (Occupational Health and Safety):

- Use personal protective equipment.
- Safe handling of tools, equipment and materials.
- Prevent from chemical and electrical hazards.





		Requi	red Knowledge				
8	Technical Knowledge		Applied	Calculation	Gr	aphical Information	on
	Tools, equipment and materials  Types  Uses  Safe handling  Storage  Introduction of solar energy and photovoltaic  Fundamentals of standalone, grid connected and hyb systems  Solar PV system  Introduction  Components and their uses  Configuration  Solar panels  Introduction  PV modules, array and string  Types  Mounting position, direction and angle  Installation and connection	rid	Аррпеи	Calculation	<ul> <li>Re mains</li> <li>Re dia</li> <li>Re dia</li> <li>Re</li> <li>Re</li> </ul>	ad and interpret anufacturer's struction/specificate ad and interpret begram of solar PV stad and interpret singram ad and interpret was a same an	tion lock system inge line
>Q<	NOSS ID: # Developed Date: 2023-11-06	Revision N	lumber: ##	Revised Date: dd/mm	n/yy	Page:11	TRADE 4 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0





- Introduction
- Types
- Functions
- **Batteries** 
  - Introduction
  - Types
  - Functions
  - o Electrolyte level and specific gravity
  - State of charge (SoC) and Depth of discharge (DoD)
  - Life cycle
- Importance of site assessment
- Factors of site assessment as per geographical location (Roof orientation, optimum direction, shading, air circulation, wiring requirement, and energy needs)
- Roof preparation and mounting techniques
- Fundamental concept of electricity
- Electrical parameters (current, resistance, voltage, continuity, power, ampacity)
- Electrical wiring, circuit and connection
- Cables/wires
- Earthing and lightning arrestor





o Introduction	
o Types	
<ul> <li>Components and their function</li> </ul>	
<ul> <li>Installation technique</li> </ul>	
<ul> <li>Earth resistance test</li> </ul>	
Protection devices	
<ul> <li>Introduction</li> </ul>	
o Types	
o Function	
Testing and commissioning of solar PV system	
Recent trends in photovoltaic and solar system	
Cleaning and waste management	
Record keeping and documentation	
Importance of first aid	
<ul> <li>Occupational health and safety rules and regulations</li> </ul>	





9	9 Assessment of Competency						
	Unit: 1						
	Unit Title: Install off-gr	id sola	r PV system upto 2 kWp				
			Candidate Details		As	ssessors De	tail
	Candidate's Name:			Assessors'	Name		ID/License No:
	Registration Number:			1.			
	Symbol No:			2.			
	Test Centre:		Test Date:	3.			
Ele	ment of competency		Performance Standards	Standard Met	Standard Not Met	Evidence Type	Comments
	Prepare tool, 1.1.5	1.1.4	Personal Protective Equipment (PPE) used in accordance				
		with task requirement.					
1.1		1.1.5	Tools, equipment and materials collected as per task				
	equipment and materials		requirement.				
	materials	1.1.6	Working condition of tools and equipment checked and				
			fault tagged.				
		1.2.1	Solar installation area determined in consultation with				
			client or as per drawing.				
1.2	Perform site	1.2.2	Site assessment conducted at peak sun hours for solar				
	assessment		installation.				
		1.2.3	Solar installation area verified as per the drawing and				





			layout for installation.		
		1.2.4	Feedback is provided based on-site assessment.		
		1.3.1	Mounting structure installed firmly in line and level		
			ensuring to withstand wind pressure.		
		1.3.2	Components of solar PV system verified and checked for		
			physical damage.		
1.3 Install PV module/array/string	1.3.3	Open circuit voltage and short circuit current measured of			
		each module and verified with manufacturer's			
			specification.		
	1.3.4	Solar PV module(s)/array/string installed firmly on			
	module/array/string		mounting structure in required direction and inclination as		
			per drawing.		
		1.3.5	PV module (s) connected in series or parallel as per system		
			design to junction/combiner box along with wire conduit.		
		1.3.6	Conduit installed and cables laid from junction/combiner		
			box to charge controller/inverter through protection		
			devices.		
		1.4.1	Location for charge controller identified in consultation		
1.4	Install charge		with client.		
<b></b> .	controller	1.4.2	Charge controller fixed firmly on designated area.		
		1.4.3	Positive and negative terminals of solar PV		

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			module(s)/array/string connected to corresponding	
			terminals of charge controller through protection devices.	
		1.4.4	Charge controller connected to DC loads.	
		1.5.1	Specific gravity and voltage of battery measured and	
			verified as per manufacturer's specification.	
		1.5.2	Batteries placed in well-ventilated area with or without	
			rack.	
		1.5.3	Batteries connected in series or parallel as per wiring	
			diagram.	
1.5	Install battery bank and solar inverter	1.5.4	Positive and negative terminals of charge controller	
1.5			connected to corresponding terminals of batter bank/pack	
			through protection devices.	
		1.5.5	Inverter firmly fixed on identified location.	
		1.5.6	Positive and negative terminals of battery bank connected	
			to corresponding terminals of inverter through protection	
			devices.	
		1.5.7	Inverter connected to AC loads.	
		1.6.1	Conduit fixed along marked route.	
1.6	Perform electrical	1.6.2	AC/DC cables laid through conduit as per specification.	
1.0	wiring	1.6.3	Junction box mounted at shortest distance between	
			charge controller and DC load of building.	

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		1.6.4	AC/DC wires connected to power sockets and loads as per		
			wiring diagram.		
		1.7.1	Earthing components checked and assembled as per		
			manufacturer's instruction.		
		1.7.2	Earthing with lightning arrestor installed as per drawing.		
		1.7.3	Earthing system connected with solar PV system as per		
1.7	Install earthing and protection devices		drawing.		
	protection devices	1.7.4	Protection devices fixed in line and level in designated		
			area.		
		1.7.5	Protection devices connected with solar PV system as per		
			wiring diagram.		
		1.8.1	Solar PV system and individual components functionality		
			checked as per system design.		
		1.8.2	Issues faced during installation rectified.		
1.8	Test solar PV system	1.8.3	Solar PV system activated as per commissioning		
			procedures.		
		1.8.4	Client oriented on operation, maintenance and cleaning of		
			solar PV system.		
		1.9.1	Tools and equipment cleaned and stored in designated		
1.9	Clean workplace		location.		
^		1.9.2	Unused and leftover materials collected and stored in		. =-

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	designated location.		
1.9.3	Workplace cleaned and waste disposed as per <b>3R's</b>		
	principle at designated location.		

**WT**- Written Test

**OQ**- Oral Question

**PT-** Practical Test

**DO** – Direct Observation

**SR**- Supervisor's report

**SN**–Simulation

**RP**- Role Play

**CS** – Case Study

**PG** –Photographs

**VD**- Video

**CT** – Certificates

**TS** – Testimonials (Reward)

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**PP** – Product Produced





## **Range Statement**

Variable		Range	
Personal protective equipment	<ul> <li>May include but not limited to:</li> <li>Mask</li> <li>Apron</li> <li>Gloves</li> <li>Safety shoes</li> <li>Safety belt</li> <li>Helmet</li> </ul>		
Site assessment	May include but not limited to:  Roof orientation/dir Shading Available space Wiring requirement		
Mounting structure	May include but not limited to:  • Frame  • Pole		
Components  NOSS ID: # Developed Date: 2023-11-06	May include but not limited to:  PV modules/array/s Solar inverter Charge controller Battery Protection devices Revision Number: ##	tring  Revised Date: dd/mm/yy	Page:19

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	DC-DC convertors	
Issues	<ul> <li>May include but not limited to:</li> <li>Electrical connection problem</li> <li>Malfunctioning of components</li> <li>Mechanical fixtures</li> </ul>	
Protection devices	<ul> <li>May include but not limited to:</li> <li>Surge Protection Device (SPD)</li> <li>Transient Voltage Suppressor (TVS)</li> <li>Miniature Circuit Breaker (MCB)</li> <li>Moulded Case Circuit Breaker (MCCB)</li> <li>DC fuse</li> <li>High Rupturing Current (HRC) fuse</li> </ul>	
3R's principle	May include but not limited to:  Reduce Reuse Recycle	





5	Unit No: 2 Unit Title: Install single phase on gird solar PV syste	em upto	o 5 kWp				
	Elements of competency	Performance standards					
		2.1.1	Personal Protective Equipment (PPE) used in accordance with task requirement.				
	2.1 Prepare tool, equipment and materials	2.1.2	Tools, equipment and materials collected as per task requirement.				
		2.1.3	Working condition of tools and equipment checked and fault tagged.				
		2.2.1	Solar installation area determined in consultation with client or as per drawing.				
		2.2.2	Site assessment conducted at peak sun hours for solar installation.				
	2.2 Perform site assessment	2.2.3	Solar installation area verified as per the drawing and marked/layout for installation.				
		2.2.4	Feedback is provided based on-site assessment.				
		2.3.1	Mounting structure installed firmly in line and level ensuring to withstand wind				
			pressure.				
		2.3.2	Components of solar PV system verified and checked for physical damage.				
		2.3.3	Open circuit voltage and short circuit current measured of each module and verified				
			with manufacturer's specification.				
	2.3 Install PV module/array/string	2.3.4	Solar PV module(s)/array/string installed firmly on mounting structure in required				
			direction and inclination as per drawing.				
		2.3.5	PV module (s) connected in series or parallel as per system design to junction/combiner				
			box through protection devices along with wire conduit.				
		2.3.6	Conduit installed and cables laid from junction/combiner box to grid-tied inverter				
			through protection devices.				





	2.4.1 Grid-tied inverter firmly fixed on identified location.
	2.4.2 Positive and negative terminals from junction/combiner box connected to
2.4 Install solar grid-tied inverter	corresponding terminals of grid-tied inverter through protection devices.
	2.4.3 Grid-tied inverter connected through smart meter to NEA national grid as per NEA
	regulation.
	2.5.1 Conduit fixed along marked route.
	2.5.2 DC/AC cables laid through conduit as per specification.
2.5 Perform electrical wiring	2.5.3 Junction box mounted at shortest distance between solar PV modules and grid-tied
	inverter.
	2.6.1 Earthing components checked and assembled as per manufacturer's instruction.
	2.6.2 Earthing with lightning arrestor installed as per drawing.
2.6 Install earthing and protection devices	2.6.3 Earthing system connected with solar PV system as per drawing.
	2.6.4 <i>Protection devices</i> fixed in line and level in designated area.
	2.6.5 Protection devices connected with solar PV system as per wiring diagram.
	2.7.1 Solar PV system and individual components functionality checked as per system design.
	2.7.2 <i>Issues</i> faced during installation rectified.
2.7 Test solar PV system	2.7.3 Solar PV system activated as per commissioning procedures.
	2.7.4 Client oriented on operation, maintenance and cleaning of solar PV system.
	2.8.1 Tools and equipment cleaned and stored in designated location.
2.8 Clean workplace	2.8.2 Unused and leftover materials collected and stored in designated location.
	2.8.3 Workplace cleaned and waste disposed as per 3R's principle at designated location.



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#### 6 Task Performance Requirements (Tools, Equipment and Materials):

• Solar PV module(s), connecting cables (UV Protective), support structure, grid-tied inverter, Pyranometer, magnetic compass, MC connector, hammer, screw drivers, pliers, chisel, adjustable wrench, spanners, hacksaw, knife, wire cutter, crimping tools, wire strippers, angle meter/set square, measuring tape, level meter, drill machine, battery operated drill machine, hot air gun blower, IR thermometer, multimeter, clamp on meter, megger, cables/wires, cable clips, galvanized/stainless steel nuts and bolts, cable lug, heat shrink tube, drift, funnel, elbow, T-jointer, power socket, switches, junction box, bus bar, marker, connectors, screws, clips, rack, cable tie, conduit, corrugated conduit, PVC tape, petroleum jelly/grease, lightning arrestor, Earth Electrodes, Earthing Strip, Earth pit, back fill compound, Earth hole drilling machine, protection devices, dust bin, dust pan, broom, first aid kit and Personal protective equipment (PPE).





### 7 Safety and Hygiene (Occupational Health and Safety):

- Use personal protective equipment.
- Safe handling of tools, equipment and materials.
- Prevent from chemical and electrical hazards.





	Required Knowledge												
8	Technical Knowledge		Applied	Calculation	Graphical Information								
	<ul> <li>Tools, equipment and materials         <ul> <li>Types</li> <li>Uses</li> <li>Safe handling</li> <li>Storage</li> </ul> </li> <li>Introduction of solar energy and photovoltaic</li> <li>Fundamentals of standalone, grid connected and hybrograms</li> <li>Solar PV system         <ul> <li>Introduction</li> <li>Components and their uses</li> <li>Configuration</li> </ul> </li> <li>Solar panels         <ul> <li>Introduction</li> <li>PV modules, array and string</li> <li>Types</li> <li>Mounting location and orientation (pitch, azimangle and optimum direction)</li> </ul> </li> </ul>		Applied	Calculation	<ul> <li>Remains</li> <li>Red</li> <li>dia</li> <li>Red</li> <li>dia</li> <li>Re</li> <li>dia</li> </ul>	raphical Information  ead and interpret  anufacturer's  struction/specificate  ead and interpret be  agram of solar PV seed and interpret si  agram  ead and interpret we  agram	tion lock system inge line						
500	O Installation and connection  NOSS ID: # Developed Date: 2023-11-06	Revision N	lumber: ##	Revised Date: dd/mm	1/yy	Page:25	CTEV2 TRADE						





- Grid-tied inverter
  - Introduction
  - Types
  - Functions
- Islanding/anti-islanding features
- Importance of site assessment
- Factors of site assessment (Roof orientation, direction, shading, wiring requirement and energy needs)
- Roof preparation and mounting techniques
- Fundamental concept of electricity
- Electrical parameters (current, resistance, voltage, continuity, power, ampacity)
- Electrical wiring, circuit and connection
- Cables/wires
- Earthing and lightning arrestor
  - Introduction
  - Types
  - o Components and their function
  - o Installation technique
- Protection devices

o Introduction





o Types		
o Function		
Testing and commissioning of solar PV system	n	
Recent trends in photovoltaic and solar syste	m	
Cleaning and waste management		
Record keeping and documentation		
Importance of first aid and first aid kit		
Occupational health and safety rules and reg	ulations	





		Assessment of Competency				
Unit: 2						
Unit Title: Install single	e phase	on-grid solar PV system upto 5 kWp				
	Candidate Details			As	sessors De	tail
Candidate's Name:			Assessors'	Name		ID/License No:
Registration Number:			1.			
Symbol No:			2.			
Test Centre:	Test Centre: Test Date: 3.					
ment of competency		Performance Standards	Standard Met	Standard Not Met	Evidence Type	Comments
	2.1.1	Personal Protective Equipment (PPE) used in accordance				
		with task requirement.				
' '	2.1.2	Tools, equipment and materials collected as per task				
• •		requirement.				
	2.1.3	Working condition of tools and equipment checked and				
		fault tagged.				
	2.2.1	Solar installation area determined in consultation with				
		client or as per drawing.				
Perform site	2.2.2	Site assessment conducted at peak sun hours for solar				
assessillelli		installation.				
	2.2.3	Solar installation area verified as per the drawing and				
	Candidate's Name: Registration Number: Symbol No: Test Centre:  Prepare tool, equipment and materials	Candidate's Name: Registration Number: Symbol No: Test Centre:  Prepare tool, equipment and materials  2.1.1  Perform site assessment  2.2.2	Unit: 2 Unit Title: Install single phase on-grid solar PV system upto 5 kWp  Candidate Details  Candidate's Name: Registration Number: Symbol No: Test Centre:  Test Date:  Performance Standards  2.1.1 Personal Protective Equipment (PPE) used in accordance with task requirement. equipment and materials  2.1.2 Tools, equipment and materials collected as per task requirement. 2.1.3 Working condition of tools and equipment checked and fault tagged.  Perform site assessment  2.2.2 Site assessment conducted at peak sun hours for solar installation.	Unit: 2 Unit Title: Install single phase on-grid solar PV system upto 5 kWp  Candidate Details  Candidate's Name: Registration Number: Symbol No: Test Centre: Test Date: 3.  Performance Standards  2.1.1 Personal Protective Equipment (PPE) used in accordance with task requirement.  Prepare tool, equipment and materials with task requirement. 2.1.2 Tools, equipment and materials collected as per task requirement. 2.1.3 Working condition of tools and equipment checked and fault tagged.  Perform site assessment  2.2.2 Site assessment conducted at peak sun hours for solar installation.	Unit: 2 Unit Title: Install single phase on-grid solar PV system upto 5 kWp  Candidate Details  Assessors' Name Registration Number: Symbol No: Test Centre: Test Date: 3.  Prepare tool, equipment and materials Tequirement. 2.1.2 Tools, equipment and materials Working condition of tools and equipment checked and fault tagged.  2.2.1 Solar installation area determined in consultation with client or as per drawing.  Perform site assessment  Assessors' Name 1. 2.1. 2.1. 3.  Standard Met Not Met  Standard Not Met  Standard Not Met  Candidate Details  Assessors' Name 1. 2.1. 2.1. 3.  Standard Not Met Not Met  Standard Not Met Not Met Standard Not Met Not Met Not Met Standard Not Met Not Met Not Met Not Met Standard Not Met N	Unit: 2 Unit Title: Install single phase on-grid solar PV system upto 5 kWp  Candidate Details Assessors Details Candidate's Name: Registration Number: Symbol No: Test Centre: Test Date:  Performance Standards Test Date:  2.1.1 Personal Protective Equipment (PPE) used in accordance with task requirement. Prepare tool, equipment and materials with task requirement. 2.1.2 Tools, equipment and materials collected as per task requirement. 2.1.3 Working condition of tools and equipment checked and fault tagged.  Perform site assessment  2.2.2 Site assessment conducted at peak sun hours for solar installation.





		marked/layout for installation.					
	2.2.4	Feedback is provided based on-site assessment.					
	2.3.1	Mounting structure installed firmly in line and level					
		ensuring to withstand wind pressure.					
	2.3.2	Components of solar PV system verified and checked for					
		physical damage.					
	2.3.3	Open circuit voltage and short circuit current measured of					
		each module and verified with manufacturer's					
Install PV module/array/string		specification.					
	2.3.4	Solar PV module(s)/array/string installed firmly on					
		mounting structure in required direction and inclination as					
		per drawing.					
	2.3.5	PV module (s) connected in series or parallel as per system					
		design to junction/combiner box through protection					
		devices along with wire conduit.					
	2.3.6	Conduit installed and cables laid from junction/combiner					
		box to grid-tied inverter through protection devices.					
	2.4.1	Grid-tied inverter firmly fixed on identified location.					
Install solar grid-tied	2.4.2	Positive and negative terminals from junction/combiner					
inverter		box connected to corresponding terminals of grid-tied					
		inverter through protection devices.					
r	module/array/string	2.3.1  2.3.2  2.3.3  Install PV	2.2.4 Feedback is provided based on-site assessment.  2.3.1 Mounting structure installed firmly in line and level ensuring to withstand wind pressure.  2.3.2 Components of solar PV system verified and checked for physical damage.  2.3.3 Open circuit voltage and short circuit current measured of each module and verified with manufacturer's specification.  2.3.4 Solar PV module(s)/array/string installed firmly on mounting structure in required direction and inclination as per drawing.  2.3.5 PV module (s) connected in series or parallel as per system design to junction/combiner box through protection devices along with wire conduit.  2.3.6 Conduit installed and cables laid from junction/combiner box to grid-tied inverter through protection devices.  2.4.1 Grid-tied inverter firmly fixed on identified location.  2.4.2 Positive and negative terminals from junction/combiner box connected to corresponding terminals of grid-tied	2.2.4 Feedback is provided based on-site assessment.  2.3.1 Mounting structure installed firmly in line and level ensuring to withstand wind pressure.  2.3.2 Components of solar PV system verified and checked for physical damage.  2.3.3 Open circuit voltage and short circuit current measured of each module and verified with manufacturer's specification.  2.3.4 Solar PV module(s)/array/string installed firmly on mounting structure in required direction and inclination as per drawing.  2.3.5 PV module (s) connected in series or parallel as per system design to junction/combiner box through protection devices along with wire conduit.  2.3.6 Conduit installed and cables laid from junction/combiner box to grid-tied inverter through protection devices.  2.4.1 Grid-tied inverter firmly fixed on identified location.  2.4.2 Positive and negative terminals from junction/combiner box connected to corresponding terminals of grid-tied	2.2.4 Feedback is provided based on-site assessment.  2.3.1 Mounting structure installed firmly in line and level ensuring to withstand wind pressure.  2.3.2 Components of solar PV system verified and checked for physical damage.  2.3.3 Open circuit voltage and short circuit current measured of each module and verified with manufacturer's specification.  2.3.4 Solar PV module(s)/array/string installed firmly on mounting structure in required direction and inclination as per drawing.  2.3.5 PV module (s) connected in series or parallel as per system design to junction/combiner box through protection devices along with wire conduit.  2.3.6 Conduit installed and cables laid from junction/combiner box to grid-tied inverter through protection devices.  2.4.1 Grid-tied inverter firmly fixed on identified location.  2.4.2 Positive and negative terminals from junction/combiner box connected to corresponding terminals of grid-tied	2.2.4 Feedback is provided based on-site assessment.  2.3.1 Mounting structure installed firmly in line and level ensuring to withstand wind pressure.  2.3.2 Components of solar PV system verified and checked for physical damage.  2.3.3 Open circuit voltage and short circuit current measured of each module and verified with manufacturer's specification.  2.3.4 Solar PV module(s)/array/string installed firmly on mounting structure in required direction and inclination as per drawing.  2.3.5 PV module (s) connected in series or parallel as per system design to junction/combiner box through protection devices along with wire conduit.  2.3.6 Conduit installed and cables laid from junction/combiner box to grid-tied inverter through protection devices.  2.4.1 Grid-tied inverter firmly fixed on identified location.  Positive and negative terminals from junction/combiner box connected to corresponding terminals of grid-tied	2.2.4 Feedback is provided based on-site assessment.  2.3.1 Mounting structure installed firmly in line and level ensuring to withstand wind pressure.  2.3.2 Components of solar PV system verified and checked for physical damage.  2.3.3 Open circuit voltage and short circuit current measured of each module and verified with manufacturer's specification.  2.3.4 Solar PV module(s)/array/string installed firmly on mounting structure in required direction and inclination as per drawing.  2.3.5 PV module (s) connected in series or parallel as per system design to junction/combiner box through protection devices along with wire conduit.  2.3.6 Conduit installed and cables laid from junction/combiner box to grid-tied inverter through protection devices.  2.4.1 Grid-tied inverter firmly fixed on identified location.  2.4.2 Positive and negative terminals from junction/combiner box connected to corresponding terminals of grid-tied

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		2.4.3	Grid-tied inverter connected through smart meter to NEA		
			national grid as per NEA regulation.		
		2.5.1	Conduit fixed along marked route.		
2.5	Perform electrical	2.5.2	DC/AC cables laid through conduit as per specification.		
	wiring	2.5.3	Junction box mounted at shortest distance between solar		
			PV modules and grid-tied inverter.		
		2.6.1	Earthing components checked and assembled as per		
			manufacturer's instruction.		
	Install earthing and protection devices	2.6.2	Earthing with lightning arrestor installed as per drawing.		
		2.6.3	Earthing system connected with solar PV system as per		
2.6			drawing.		
		2.6.4	Protection devices fixed in line and level in designated		
			area.		
		2.6.5	Protection devices connected with solar PV system as per		
			wiring diagram.		
		2.7.1	Solar PV system and individual components functionality		
			checked as per system design.		
		2.7.2	Issues faced during installation rectified.		
2.7	Test solar PV system	2.7.3	Solar PV system activated as per commissioning		
			procedures.		
		2.7.4	Client oriented on operation, maintenance and cleaning of		

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	solar PV system.	
	2.8.1 Tools and equipment cleaned and stored in designated	
	location.	
	2.8.2 Unused and leftover materials collected and stored in	
2.8 Clean workplace	designated location.	
	2.8.3 Workplace cleaned and waste disposed as per <b>3R's</b>	
	principle at designated location.	

**WT**- Written Test

**OQ**- Oral Question

**PT-** Practical Test

**DO** – Direct Observation

**SR**- Supervisor's report

**SN**–Simulation

**RP**- Role Play

**PG** –Photographs

**VD**- Video

**CT** – Certificates

**TS** – Testimonials (Reward)

**PP** – Product Produced

**CS** – Case Study





## **Range Statement**

Variable	Range			
Personal protective equipment	May include but not limited to:			
	• Mask			
	• Apron			
	• Gloves			
	Safety shoes			
	Safety belt			
	Helmet			
Site assessment	May include but not limited to:			
	Roof orientation/direction			
	• Shading			
	Available space			
	Wiring requirement			
Mounting structure	May include but not limited to:			
	• Frame			
	• Pole			
Components	May include but not limited to:			
	PV modules/array/string			
	Grid-tied inverter			
	Protection devices			



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Protection devices	<ul> <li>May include but not limited to:</li> <li>Surge Protection Device (SPD)</li> <li>Transient Voltage Suppressor (TVS)</li> <li>Miniature Circuit Breaker (MCB)</li> <li>Moulded Case Circuit Breaker (MCCB)</li> <li>DC fuse</li> <li>High Rupturing Capacity (HRC) fuse</li> </ul>
Issues	<ul> <li>May include but not limited to:</li> <li>Electrical connection problem</li> <li>Malfunctioning of components</li> <li>Mechanical fixtures</li> <li>Islanding/Anti-islanding</li> </ul>
3R's principle	May include but not limited to:  Reduce Reuse Recycle





5	Unit No: 3 Unit Title: Install solar water pump upto 1500 W			Unit code:	
	Elements of competency		Performance standards		
		3.1.1	Personal Prot	ective Equipment (PPE) used in accordance with task requirement.	
	3.1 Prepare tool, equipment and materials	3.1.2	Tools, equipm	ent and materials collected as per task requirement.	
		3.1.3	Working cond	ition of tools and equipment checked and fault tagged.	
		3.2.1	Solar installat	on area determined in consultation with client or as per drawing.	
		3.2.2	Site assessme	nt conducted at peak sun hours for solar installation.	
	3.2 Perform site assessment	3.2.3	Solar installat	on area verified as per the drawing and marked/layout for installation.	
		3.2.4	Feedback is p	ovided based on-site assessment.	
		3.3.1	Mounting str	acture installed firmly in line and level ensuring to withstand wind	
			pressure.		
		3.3.2	Components	of solar PV system verified and checked for physical damage.	
		3.3.3	Open circuit v	oltage and short circuit current measured of each module and verified	
			with manufac	turer's specification.	
	3.3 Install PV module/array/string	3.3.4	Solar PV mode	ule(s)/array/string installed firmly on mounting structure in required	
	· -		direction and	inclination as per drawing.	
		3.3.5	PV module (s)	connected in series or parallel as per system design to junction/combiner	
			box along with	n wire conduit through protection devices.	
		3.3.6	Conduit instal	led and cables laid from junction/combiner box to variable frequency	
			drive (VFD)/co	ontroller unit through protection devices.	





	3.4.1 Location for VFD/controller unit identified in consultation with client.
	3.4.2 VFD/controller unit fixed firmly on designated area.
3.4 Install VFD and controller unit	3.4.3 Positive and negative terminals of solar PV module(s)/array/string connected to
	corresponding terminals of VFD/controller unit through protection devices.
	3.5.1 PV pump and components verified as per specification.
	3.5.2 PV pump installed as per drawing.
3.5 Install PV pump	3.5.3 Terminals of pump connected to corresponding terminals of VFD/controller unit
	through protection devices as per drawing.
	3.6.1 Conduit fixed along marked route.
3.6 Perform electrical wiring	3.6.2 AC/DC cables laid through conduit as per specification.
	3.6.3 Junction box mounted at shortest distance between VFD/controller unit to pump.
	3.7.1 Earthing components checked and assembled as per manufacturer's instruction.
	3.7.2 Earthing with lightning arrestor installed as per drawing.
3.7 Install earthing and protection devices	3.7.3 Earthing system connected with solar PV water pump system as per drawing.
	3.7.4 <i>Protection devices</i> fixed in line and level in designated area.
	3.7.5 Protection devices connected with solar PV water pump system as per wiring diagram.
	3.8.1 Solar PV water pump system and individual components functionality checked as per
	system design.
3.8 Test solar PV water pump system	3.8.2 <i>Issues</i> faced during installation rectified.
	3.8.3 Solar PV water pump system activated as per commissioning procedures.
	3.8.4 Client oriented on operation, maintenance and cleaning of solar PV water pump system



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		3.9.1 Tools and equipment cleaned and stored in designated location.		
	3.9 Clean workplace	3.9.2 Unused and left over materials collected and stored in designated location.		
		3.9.3 Workplace cleaned and waste disposed as per <i>3R's principle</i> at designated location.		
6	Task Performance Requirements (Tools, Equipment and Materials):			
	• Solar PV module(s), connecting cables (UV Protective), support structure, VFD, controller unit, water pump, check valve, Pyranometer,			
	magnetic compass, MC connector, hammer, screw drivers, pliers, chisel, adjustable wrench, spanners, hacksaw, knife, wire cutter, crimping			
	tools, wire strippers, angle meter/set square, measuring tape, level meter, drill machine, battery operated drill machine, hot air gun blower,			
	IR thermometer, multimeter, clamp on meter, megger, cables/wires, thermocouple, cable clips, galvanized/stainless steel nuts and bolts			
	cable lug, heat shrink tube, drift, funnel, plumb bob, elbow, T-jointer, power socket, switches, junction box, bus bar, marker, connectors,			
	screws, clips, rack, cable tie, conduit, corrugated conduit, PVC tape, Teflon tape, petroleum jelly/grease, lightning arrestor, Earth Electrodes,			
	Earthing Strip, Earth pit, back fill compound, tool for drilling hole in the ground, protection devices, dust bin, dust pan, broom, first aid kit and			
	Personal protective equipment (PPE).			
7	Safety and Hygiene (Occupational Health and Safe	:y):		
	Use personal protective equipment.			
	Safe handling of tools, equipment and materials.			
	Prevent from chemical and electrical hazards.			

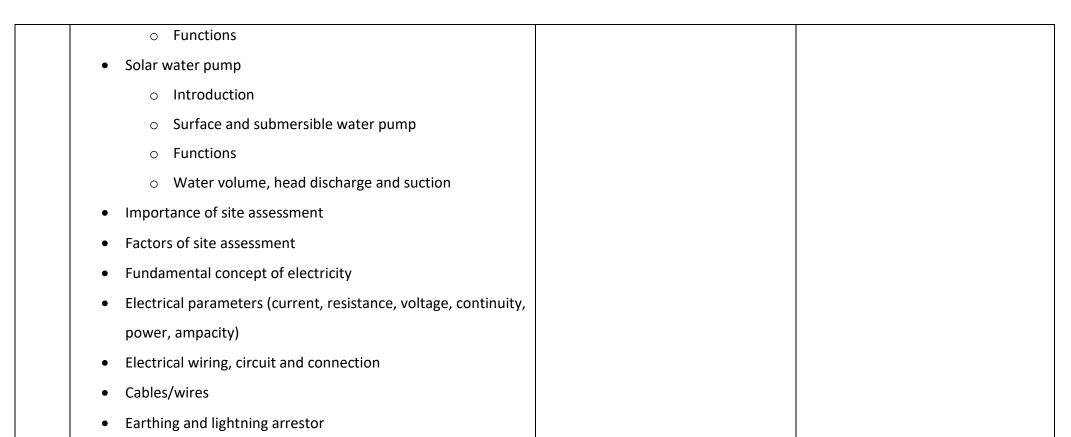




		Requi	red Knowledge				
8	Technical Knowledge		Applied	Calculation	Gra	aphical Informatio	n
8	Technical Knowledge  Tools, equipment and materials Types Uses Safe handling Storage Introduction of solar energy and photovoltaic Solar PV system Introduction Components and their uses Configuration  Solar panels Introduction PV modules, array and string	Requi		Calculation	<ul> <li>Reading</li> &lt;</ul>	aphical Information ad and interpret anufacturer's truction/specificate ad and interpret bl gram of solar PV s ad and interpret si gram ad and interpret w gram	ion lock ystem nge line
	<ul><li>Types</li><li>Mounting position, direction and angle</li></ul>						
	<ul> <li>Installation and connection</li> <li>Variable frequency drive and controller unit</li> <li>Introduction</li> </ul>						
	o Types						CTEVA
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_	Introd	uction

- o Introduction
- o Types
- o Components and their function
- o Installation technique
- Protection devices
  - Introduction
  - Types

NOSS ID: #





o Function
Testing and commissioning of solar PV water pump system
Recent trends in photovoltaic and solar system
Cleaning and waste management
Record keeping and documentation
Importance of first aid
Occupational health and safety rules and regulations





	Assessment of Competency									
Unit: 3										
Unit Title: Install solar										
		Candidate Details	Assessors Detail							
Candidate's Name:			Assessors'	Name		ID/License No:				
Registration Number:			1.							
Symbol No:			2.							
Test Centre:		Test Date:	3.							
Element of competency		Performance Standards	Standard Met	Standard Not Met	Evidence Type	Comments				
	3.1.1	Personal Protective Equipment (PPE) used in accordance								
		with task requirement.								
• •	3.1.2	Tools, equipment and materials collected as per task								
•		requirement.								
	3.1.3	Working condition of tools and equipment checked and								
		fault tagged.								
	3.2.1	Solar installation area determined in consultation with								
		client or as per drawing.								
Perform site	3.2.2	Site assessment conducted at peak sun hours for solar								
معهد عالما الله		installation.								
	3.2.3	Solar installation area verified as per the drawing and								
	Candidate's Name: Registration Number: Symbol No: Test Centre:  ment of competency  Prepare tool, equipment and materials	Candidate's Name: Registration Number: Symbol No: Test Centre:  ment of competency  3.1.1  Prepare tool, equipment and materials  3.1.3  Perform site assessment  3.2.2	Unit: 3 Unit Title: Install solar water pump upto 1500 W  Candidate Details  Candidate's Name: Registration Number: Symbol No: Test Centre:  Test Date:  Performance Standards  3.1.1 Personal Protective Equipment (PPE) used in accordance with task requirement.  3.1.2 Tools, equipment and materials collected as per task requirement.  3.1.3 Working condition of tools and equipment checked and fault tagged.  3.2.1 Solar installation area determined in consultation with client or as per drawing.  3.2.2 Site assessment conducted at peak sun hours for solar installation.	Unit: 3 Unit Title: Install solar water pump upto 1500 W  Candidate Details  Candidate's Name: Registration Number: Symbol No: Test Centre: Test Date: 3.  Ment of competency Performance Standards Standards Met  3.1.1 Personal Protective Equipment (PPE) used in accordance with task requirement.  Prepare tool, equipment and materials collected as per task requirement.  3.1.2 Tools, equipment and materials collected as per task requirement.  3.1.3 Working condition of tools and equipment checked and fault tagged.  3.2.1 Solar installation area determined in consultation with client or as per drawing.  Perform site assessment  3.2.2 Site assessment conducted at peak sun hours for solar installation.	Unit: 3 Unit Title: Install solar water pump upto 1500 W  Candidate Details  Assessors' Name Registration Number: Symbol No: Test Centre: Test Date:  3.  Ment of competency  Performance Standards  3.1.1 Personal Protective Equipment (PPE) used in accordance with task requirement.  Prepare tool, equipment and materials materials  3.1.2 Tools, equipment and materials collected as per task requirement.  3.1.3 Working condition of tools and equipment checked and fault tagged.  3.2.1 Solar installation area determined in consultation with client or as per drawing.  Perform site assessment  3.2.2 Site assessment conducted at peak sun hours for solar installation.	Unit: 3 Unit Title: Install solar water pump upto 1500 W  Candidate Details  Candidate Details  Assessors Details  Candidate's Name:  Registration Number:  Symbol No:  Test Centre:  Test Date:  3.  Ment of competency  Performance Standards  3.1.1 Personal Protective Equipment (PPE) used in accordance with task requirement.  Prepare tool, equipment and materials  ali.3 Working condition of tools and equipment checked and fault tagged.  3.2.1 Solar installation area determined in consultation with client or as per drawing.  Perform site assessment  3.2.2 Site assessment conducted at peak sun hours for solar installation.				





			marked/layout for installation.		
		3.2.4	Feedback is provided based on-site assessment.		
		3.3.1	Mounting structure installed firmly in line and level		
			ensuring to withstand wind pressure.		
		3.3.2	Components of solar PV system verified and checked for		
			physical damage.		
		3.3.3	Open circuit voltage and short circuit current measured of		
			each module and verified with manufacturer's		
			specification.		
3.3	Install PV module/array/string	3.3.4	Solar PV module(s)/array/string installed firmly on		
0.0			mounting structure in required direction and inclination as		
			per drawing.		
		3.3.5	PV module (s) connected in series or parallel as per system		
			design to junction/combiner box along with wire conduit		
			through protection devices.		
		3.3.6	Conduit installed and cables laid from junction/combiner		
			box to variable frequency drive (VFD)/controller unit		
			through protection devices.		
		3.4.1	Location for VFD/controller unit identified in consultation		
3.4	Install VFD and controller unit		with client.		
		3.4.2	VFD/controller unit fixed firmly on designated area.		

		3.4.3	Positive and negative terminals of solar PV			
			module(s)/array/string connected to corresponding			
			terminals of VFD/controller unit through protection			
			devices.			
		3.5.1	PV pump and components verified as per specification.			
		3.5.2	PV pump installed as per drawing.			
3.5	Install PV pump	3.5.3	Terminals of pump connected to corresponding terminals			
			of VFD/controller unit through protection devices as per			
			drawing.			
		3.6.1	Conduit fixed along marked route.			
3.6	Perform electrical	3.6.2	AC/DC cables laid through conduit as per specification.			
	wiring	3.6.3	Junction box mounted at shortest distance between			
			VFD/controller unit to pump.			
		3.7.1	Earthing components checked and assembled as per			
			manufacturer's instruction.			
		3.7.2	Earthing with lightning arrestor installed as per drawing.			
3.7	Install earthing and	3.7.3	Earthing system connected with solar PV water pump			
	protection devices		system as per drawing.			
		3.7.4	Protection devices fixed in line and level in designated			
			area.			
^		3.7.5	Protection devices connected with solar PV water pump			



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			system as per wiring diagram.		
		3.8.1	Solar PV water pump system and individual components		
			functionality checked as per system design.		
		3.8.2	Issues faced during installation rectified.		
	Test solar PV water	3.8.3	Solar PV water pump system activated as per		
	pump system		commissioning procedures.		
		3.8.4	Client oriented on operation, maintenance and cleaning of		
			solar PV water pump system.		
		3.9.1	Tools and equipment cleaned and stored in designated		
			location.		
		3.9.2	Unused and left over materials collected and stored in		
3.9	Clean workplace		designated location.		
		3.9.3	Workplace cleaned and waste disposed as per 3R's		
			principle at designated location.		

**WT**- Written Test

**OQ**- Oral Question

**PT-** Practical Test

**DO** – Direct Observation

**SR**- Supervisor's report

**SN**–Simulation

**RP**- Role Play

**PG** –Photographs

**VD**- Video

**CT** – Certificates

**TS** – Testimonials (Reward)

Revised Date: dd/mm/yy

**PP** – Product Produced

**CS** – Case Study



NOSS ID: #



## Range Statement

Variable	Variable Range							
Personal protective equipment	May in	clude but not limited to:  Mask Apron Gloves Safety shoes Safety belt Helmet						
Site assessment	May in	clude but not limited to: Roof orientation/dir Shading Available space Wiring requirement						
Mounting structure	May in	clude but not limited to: Frame Pole						
Components  NOSS ID: # Developed Date: 2023-11-06	•	clude but not limited to:  PV modules/array/s Solar inverter VFD Controller unit Protection devices	tring  Revised Date: dd/mm/yy	Page:44	CTEV-			

Protection devices	<ul> <li>May include but not limited to:</li> <li>Surge Protection Device (SPD)</li> <li>Transient Voltage Suppressor (TVS)</li> <li>Miniature Circuit Breaker (MCB)</li> <li>Moulded Case Circuit Breaker (MCCB)</li> <li>DC fuse</li> </ul>
Issues	<ul> <li>May include but not limited to:</li> <li>Electrical connection problem</li> <li>Malfunctioning of components</li> <li>Mechanical fixtures</li> <li>Water discharge</li> </ul>
3R's principle	May include but not limited to:  Reduce Reuse Recycle





5	Unit No: 4 Unit Title: Install solar	street light			Unit code:				
	Elements	of competency	Performance standards						
			4.1.1	Personal Prot	ective Equipme	ent (PPE) used in accordance with	task requirement.	•	
	4.1 Prepare tool, e	quipment and materials	4.1.2	Tools, equipm	ent and materi	als collected as per task requirement	ent.		
			4.1.3	Working cond	ition of tools ar	nd equipment checked and fault to	agged.		
			4.2.1	Solar installati	on area determ	nined in consultation with client o	r as per drawing.		
			4.2.2	Site assessme	<b>nt</b> conducted a	t peak sun hours for solar installat	tion.		
	4.2 Perform site as	sessment	4.2.3	Solar installati	on area verifie	d as per the drawing and layout fo	or installation.		
			4.2.4	Feedback is pr	ovided based o	on-site assessment.			
			4.3.1	Mounting stru	<i>icture</i> and light	installed firmly on pole in line and	d level ensuring to	)	
				withstand win	d pressure.				
					of solar PV syste	em verified and checked for physic	cal damage.		
			4.3.3	Open circuit v	oltage and sho	rt circuit current measured of eacl	h module and veri	ified	
	4.3 Install PV modu	ıle (s) and light		with manufact	curer's specifica	ation.			
			4.3.4	Solar PV modu	ıle(s) installed f	firmly on mounting frame in requi	red direction and		
				inclination as	per drawing.				
			4.3.5	PV module (s)	connected as p	per system design along with wire	conduit.		
			4.4.1	Charge contro	ller unit and ba	attery unit fixed firmly on designat	ed area.		
	4.4 Install charge s	ontroller unit and battons	4.4.2	Voltage of bat	tery measured	and verified as per manufacturer'	s specification.		
	unit	4.4 Install charge controller unit and battery unit	4.4.3	Positive and n	egative termina	als of charge controller connected	to corresponding	5	
$\wedge$				terminals of b	of battery unit.				
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	4.4.4 Positive and negative terminals of solar PV module(s) connected to charge controller.									
	4.4.5 Positive and negative terminals of charge controller connected to corresponding									
	terminals of street light.									
	4.5.1 Functionality of street light, battery and charge controller checked as per system design.									
4.5 Test street light	4.5.2 <i>Issues</i> faced during installation rectified.									
	4.5.3 Street light activated and illumination tested as per manufacturer's specification.									
	4.6.1 Tools and equipment cleaned and stored in designated location.									
4.6 Clean workplace	4.6.2 Unused and left over materials collected and stored in designated location.									
	4.6.3 Workplace cleaned and waste disposed as per 3R's principle at designated location.									
6 Task Performance Requirements (Tools, Equip	Task Performance Requirements (Tools, Equipment and Materials):									
Solar PV module(s), connecting cables	(UV Protective), support structure, charge controller unit, battery, street light, pole, Pyranometer,									
magnetic compass, MC connector, ham	magnetic compass, MC connector, hammer, wrenches sets, screw drivers, pliers, chisel, adjustable wrench, spanners, hacksaw, knife, cutting									

pliers, crimping tools, wire strippers, angle meter/set square, measuring tape, level meter, drill machine, battery operated drill machine, hot air gun blower, IR thermometer, multimeter, clamp on meter, megger, cables/wires, lux meter, cable clips, galvanized/stainless steel nuts and bolts, cable lug, heat shrink tube, switches, junction box, adjustable staircase, marker, connectors, screws, cable tie, corrugated conduit, PVC tape, petroleum jelly/grease, protection devices, dust bin, dust pan, broom, first aid kit and Personal protective equipment (PPE).

## Safety and Hygiene (Occupational Health and Safety):

- Use personal protective equipment.
- Safe handling of tools, equipment and materials.



7



• Prevent from chemical and electrical hazards.





		Requir	ed Knowledge				
8	Technical Knowledge		Applied (	Calculation	Gra	phical Informatio	n
	<ul><li>Tools, equipment and materials</li><li>Types</li><li>Uses</li></ul>				maı	d and interpret nufacturer's ruction/specificat	ion
	<ul><li>Safe handling</li><li>Storage</li><li>Solar panels</li></ul>				• Rea	d and interpret bl	ock
	<ul> <li>Introduction</li> <li>PV modules</li> <li>Types</li> <li>Mounting position, direction and angle</li> </ul>						
	<ul> <li>Installation and connection</li> <li>Charge controller unit</li> <li>Introduction</li> <li>Types</li> </ul>						
_	<ul> <li>Functions</li> <li>Batteries</li> <li>Introduction</li> <li>Types</li> <li>Functions</li> </ul>						
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Electrolyte level and specific gravity	
<ul> <li>State of charge (SoC) and Depth of discharge (DoD)</li> </ul>	
Street light	
<ul> <li>Introduction</li> </ul>	
o Types	
<ul> <li>Functions</li> </ul>	
Cleaning and maintenance	
Importance of site assessment	
Factors of site assessment	
Fundamental concept of electricity	
Electrical parameters	
Electrical wiring, circuit and connection	
Cables/wires	
Testing and commissioning of street light	
Cleaning and waste management	
Record keeping and documentation	
Importance of first aid	
Occupational health and safety rules and regulations	





9	Assessment of Competency									
	Unit: 4									
	Unit Title: Install solar street light									
		Candidate Details				Assessors Detail				
	Candidate's Name:	Candidate's Name:			Name		ID/License No:			
	Registration Number:									
	Symbol No:			2.						
	Test Centre:		Test Date:	3.						
Ele	ment of competency		Performance Standards	Standard Met	Standard Not Met	Evidence Type	Comments			
	Prepare tool, equipment and materials	4.1.1	Personal Protective Equipment (PPE) used in accordance							
			with task requirement.							
4.1		4.1.2	Tools, equipment and materials collected as per task							
			requirement.							
		4.1.3	Working condition of tools and equipment checked and							
			fault tagged.							
	Perform site assessment	4.2.1	Solar installation area determined in consultation with							
			client or as per drawing.							
4.2		4.2.2	Site assessment conducted at peak sun hours for solar							
			installation.							
		4.2.3	Solar installation area verified as per the drawing and							





			layout for installation.		
		4.2.4	Feedback is provided based on-site assessment.		
		4.3.1	Mounting structure and light installed firmly on pole in line		
			and level ensuring to withstand wind pressure.		
		4.3.2	Components of solar PV system verified and checked for		
			physical damage.		
		4.3.3	Open circuit voltage and short circuit current measured of		
4.3	Install PV module (s) and light		each module and verified with manufacturer's		
			specification.		
		4.3.4	Solar PV module(s) installed firmly on mounting frame in		
			required direction and inclination as per drawing.		
		4.3.5	PV module (s) connected as per system design along with		
			wire conduit.		
	Install charge controller unit and battery unit	4.4.1	Charge controller unit and battery unit fixed firmly on		
			designated area.		
		4.4.2	Voltage of battery measured and verified as per		
4.4			manufacturer's specification.		
		4.4.3	Positive and negative terminals of charge controller		
			connected to corresponding terminals of battery unit.		
		4.4.4	Positive and negative terminals of solar PV module(s)		
			connected to charge controller.		
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	4.4.5 Positive and negative terminals of charge controller	
	connected to corresponding terminals of street light.	
	4.5.1 Functionality of street light, battery and charge controller	
	checked as per system design.	
4.5 Test street light	4.5.2 <i>Issues</i> faced during installation rectified.	
	4.5.3 Street light activated and illumination tested as per	
	manufacturer's specification.	
	4.6.1 Tools and equipment cleaned and stored in designated	
	location.	
	4.6.2 Unused and left over materials collected and stored in	
4.6 Clean workplace	designated location.	
	4.6.3 Workplace cleaned and waste disposed as per <i>3R's</i>	
	principle at designated location.	

**WT**- Written Test

**OQ**- Oral Question

**PT-** Practical Test

**DO** – Direct Observation

**SR**- Supervisor's report

**SN**–Simulation

**RP**- Role Play

**PG** –Photographs

**VD**- Video

**CT** – Certificates

**TS** – Testimonials (Reward)

**PP** – Product Produced

**CS** – Case Study



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## **Range Statement**

Variable	Range					
Personal protective equipment	May include but not limited to:  Mask Apron Gloves Safety shoes Safety belt Helmet					
Site assessment	May include but not limited to:  Roof orientation/di Shading Available space Wiring requirement					
Mounting structure	May include but not limited to:  • Frame  • Pole					
Components  NOSS ID: # Developed Date: 2023-11-06	May include but not limited to:  PV modules Solar inverter Charge controller Battery Protection devices  Revision Number: ##	Revised Date: dd/mm/yy	Page:54			

	<ul><li>DC-DC convertors</li><li>Street light</li></ul>
Issues	<ul> <li>May include but not limited to:</li> <li>Electrical connection problem</li> <li>Malfunctioning of components</li> <li>Mechanical fixtures</li> </ul>
3R's principle	May include but not limited to:  Reduce Reuse Recycle



