



# Model Curriculum

**QP Name: Solar Panel Installation Technician**

**QP Code: ELE/Q5901**

**QP Version: 3.0**

**NSQF Level: 4**

**Model Curriculum Version: 3.0**

Electronics Sector Skills Council of India || 155, 2nd Floor, ESC House, Okhla Industrial Area- Phase 3, New Delhi- 110020

# Table of Contents

Training Parameters.....	3
Program Overview .....	4
Training Outcomes.....	4
Compulsory Modules.....	4
Module 1: Introduction and orientation to the role of a Solar Panel Installation Technician .....	6
Module 2: Process of checking site conditions, collect tools and raw materials.....	7
Module 3: Process of installing the solar panel .....	9
Module 4: Soft Skills and Work Ethics.....	11
Module 5: Basic Health and Safety Practice .....	13
Module 6: Employability Skills (60 Hours) .....	15
Module 7: On-the-Job Training.....	16
Annexure.....	17
Trainer Requirements .....	17
Assessor Requirements.....	18
Assessment Strategy.....	19
References .....	21
Glossary.....	21
Acronyms and Abbreviations.....	22

## Training Parameters

<b>Sector</b>	Electronics
<b>Sub-Sector</b>	Solar & LED
<b>Occupation</b>	Installation
<b>Country</b>	India
<b>NSQF Level</b>	4
<b>Aligned to NCO/ISCO/ISIC Code</b>	NCO-2015/NIL
<b>Minimum Educational Qualification and Experience</b>	8th Grade Pass + NTC (2 years after 8th) + 2 Year NAC/relevant Experience) OR 10th Grade pass + 2 Year NTC/NAC/ relevant experience OR Certificate-NSQF (Level-3 in Maintenance Technician) with 2 Years of relevant Experience OR 12th Class and 18 Years
<b>Pre-Requisite License or Training</b>	NA
<b>Minimum Job Entry Age</b>	18 Years
<b>Last Reviewed On</b>	27/01/2022
<b>Next Review Date</b>	02/06/2025
<b>NSQC Approval Date</b>	27/01/2022
<b>QP Version</b>	3.0
<b>Model Curriculum Creation Date</b>	27/01/2022
<b>Model Curriculum Valid Up to Date</b>	02/06/2025
<b>Model Curriculum Version</b>	3.0
<b>Maximum Duration of the Course</b>	600 Hours

## Program Overview

This section summarizes the end objectives of the program along with its duration.

### Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills:

- Describe the process of checking site conditions, collect tools and raw materials.
- Demonstrate the process of installing the solar panel.
- Explain the importance of following inclusive practices for all genders and PwD at work.
- Demonstrate various practices to be followed to maintain health and safety at work.

### Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Recommended)	On-the-Job Training Duration (Mandatory)	Total Duration
<b>Bridge Module</b>	<b>06:00</b>	<b>24:00</b>	<b>00:00</b>	<b>00:00</b>	<b>30:00</b>
Module 1: Introduction and orientation to the role of a Solar Panel Installation Technician	06:00	24:00	00:00	00:00	30:00
<b>ELE/N5901: Check site conditions, collect tools and raw materials</b> <b>NSQF Level- 4</b>	<b>60:00</b>	<b>90:00</b>	<b>00:00</b>	<b>75:00</b>	<b>225:00</b>
Module 2: Process of checking site conditions, collect tools and raw materials	60:00	90:00	00:00	75:00	225:00
<b>ELE/N5902: Install the solar panel</b> <b>NSQF Level- 4</b>	<b>60:00</b>	<b>90:00</b>	<b>00:00</b>	<b>75:00</b>	<b>225:00</b>
Module 3: Process of installing the solar panel	60:00	90:00	00:00	75:00	225:00
<b>ELE/N9905 Work effectively at the workplace</b> <b>NSQF Level- 4</b>	<b>15:00</b>	<b>15:00</b>	<b>00:00</b>	<b>00:00</b>	<b>30:00</b>

Module 4: Soft Skills and Work Ethics	15:00	15:00	00:00	00:00	30:00
<b>ELE/N1002 Apply health and safety practices at the workplace NSQF Level- 4</b>	<b>15:00</b>	<b>15:00</b>	<b>00:00</b>	<b>00:00</b>	<b>30:00</b>
Module 5: Basic Health and Safety Practice	15:00	15:00	00:00	00:00	30:00
<b>DGT/VSQ/N0102- Employability Skills (60 Hours)</b>	<b>24:00</b>	<b>36:00</b>	<b>00:00</b>	<b>00:00</b>	<b>60:00</b>
Module 6: Employability Skills (60 Hours)	24:00	36:00	00:00	00:00	60:00
<b>Total Duration</b>	<b>180:00</b>	<b>270:00</b>	<b>00:00</b>	<b>150:00</b>	<b>600:00</b>

# Module Details

## Module 1: Introduction and orientation to the role of a Solar Panel Installation Technician

### Bridge Module

#### Terminal Outcomes:

- Discuss the job role of a Solar Panel Installation Technician.

<b>Duration: 06:00</b>	<b>Duration: 24:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Describe the size and scope of the electronics industry and its sub-sectors.</li> <li>• Discuss the role and responsibilities of a Solar Panel Installation Technician.</li> <li>• Describe various employment opportunities for a Solar Panel Installation Technician.</li> </ul>	
<b>Classroom Aids</b>	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop	
<b>Tools, Equipment and Other Requirements</b>	
NA	

## Module 2: Process of checking site conditions, collect tools and raw materials

*Mapped to ELE/N5901 v2.0*

### Terminal Outcomes:

- Describe the process of identifying and planning the work target.
- Describe the process of assessing the site condition.
- Describe the process of identifying the installation requirement.
- Explain the need of collecting recommended material for installation.
- Explain the importance of ensuring proper handling and storage of material.

<b>Duration: 60:00</b>	<b>Duration: 90:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain company’s policies on incentives, personnel management, code of conduct, documentation, installation, customer support etc.</li> <li>• Describe company’s different department and concerned authority, culture and reporting structure.</li> <li>• Explain the importance of individuals role in the work flow.</li> <li>• Explain the basics of solar energy and power generation systems.</li> <li>• Describe the use and handling procedure of solar panels.</li> <li>• Explain basic electrical system and its functioning.</li> <li>• Explain mechanical equipment and its functioning.</li> <li>• Describe maintenance procedure of equipment.</li> <li>• State various parameters for assessing the site suitability for solar panel installation.</li> <li>• List the tools involved in installation of system.</li> <li>• State various quality and process standards.</li> <li>• Explain the importance of wearing protective clothing and other safety gear while carrying out installation.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate how to assess the site for identify pre-requisites for solar panel installation.</li> <li>• Show how to cover the glass module with an opaque material in storage to ensure that there is no electricity generation before installation.</li> <li>• Demonstrate how to operate/use different tools such as screw driver, inspection fixtures, wire cutter, pliers, tester, spanner, etc.</li> </ul>

<ul style="list-style-type: none"> <li>List various precautions to be taken while handling different electrical and mechanical products.</li> </ul>	
<p><b>Classroom Aids</b></p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p><b>Tools, Equipment and Other Requirements</b></p>	
<p>Different types of Solar Panels, Components of a Solar PV Installation Systems, Solar Lighting and other application systems, Inverters, Charge Controllers, Testing Equipment, Hand tools, Product Manuals of PV Panels, Charge Controllers, Inverters, Battery Bank, On Grid and Off Grid System components</p>	

## Module 3: Process of installing the solar panel

*Mapped to ELE/N5902 v2.0*

### Terminal Outcomes:

- Explain the need of understanding installation and material usage procedure.
- Describe the process of assessing mounting and installing the panel.
- Demonstrate the process of connecting the system and checking for functioning.
- Explain the importance of completing the work.
- Explain the importance of following quality and safety procedures.

<b>Duration: 60:00</b>	<b>Duration: 90:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain company’s policies on: incentives, personnel management.</li> <li>• Explain company’s code of conduct.</li> <li>• Explain the importance of individuals role in the work flow.</li> <li>• Explain company’s installation and customer support policy.</li> <li>• Explain the basics of solar energy system and power generation.</li> <li>• Describe various solar energy system components such as panels, batteries, charge controllers, inverters.</li> <li>• Explain the significance of volts, amps and watts: series and parallel connection.</li> <li>• Explain the handling procedure for solar panels.</li> <li>• Explain basic electrical system and its functioning.</li> <li>• Explain mechanical equipment and their functioning.</li> <li>• Describe the maintenance procedure of equipment.</li> <li>• State the voltage requirement of various equipment.</li> <li>• State panel mounting and inclination and angle of tilt.</li> <li>• Explain the importance of sunlight and direction assessment.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate how to disconnect PV module from any electric sources such as batteries, inverters, etc., before working on the module.</li> <li>• Show how to check that the module is defect free before installing.</li> <li>• Demonstrate the process of assessing the degree of inclination and angle of tilt of PV module for the specific area, locality or region to enable the system absorb maximum annual sunlight.</li> <li>• Show how to set the mounting fixture firmly at the desired location.</li> <li>• Demonstrate the process of removing packaging of the solar panel carefully.</li> <li>• Show how to cover the module with opaque material while installing to avoid any current generation.</li> <li>• Demonstrate the process of installing spare fuse to avoid any short circuits as per company policy.</li> <li>• Show how to mount the module on the fixture with the mounting rails using bolts and nuts.</li> <li>• Demonstrate the use of the recommended cables to connect multiple PV modules in combination to generate the desired voltage and current.</li> <li>• Demonstrate how to connect the system and check its functioning.</li> </ul>

<ul style="list-style-type: none"> <li>• Describe site surveying methods and evaluation parameters.</li> <li>• List various tools involved in installation of system.</li> <li>• Explain basic electrical engineering and circuitry.</li> <li>• State occupational health and safety standards and waste management procedures.</li> </ul>	<ul style="list-style-type: none"> <li>• Show how to remove all the tools, consumables used and clean the work area after completing the installation activity.</li> <li>• Show how to remove any metals or jewellery to avoid possibility of current shock during installation activity.</li> <li>• Demonstrate how to dispose-off any waste materials in accordance with safe working practices and procedures.</li> </ul>
<p><b>Classroom Aids</b></p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p><b>Tools, Equipment and Other Requirements</b></p>	
<p>Different types of Solar Panels, Components of a Solar PV Installation Systems, Solar Lighting and other application systems, Inverters, Charge Controllers, Testing Equipment, Hand tools, Product Manuals of PV Panels, Charge Controllers, Inverters, Battery Bank, On Grid and Off Grid System components</p>	

## Module 4: Soft Skills and Work Ethics

Mapped to ELE/N9905 v2.0

### Terminal Outcomes:

- Work effectively at the workplace.
- Implement the practices related to gender and PwD sensitization.

Duration: 15:00	Duration: 15:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• State the importance of work ethics and workplace etiquette</li> <li>• State the importance of effective communication and interpersonal skills.</li> <li>• Explain ways to maintain discipline at the workplace.</li> <li>• Discuss the common reasons for interpersonal conflict and ways of managing them effectively.</li> <li>• Discuss the importance of following organisational guidelines for dress code, time schedules, language usage and other behavioural aspects.</li> <li>• Explain the importance of working as per the workflow of the organisation to receive instructions and report problems.</li> <li>• Explain the importance of conveying information/instructions as per defined protocols to the authorised persons/team members.</li> <li>• Explain the common workplace guidelines and legal requirements on non-disclosure and confidentiality of business-sensitive information.</li> <li>• Describe the process of reporting grievances and unethical conduct such as data breaches, sexual harassment at the workplace, etc.</li> <li>• Explain the concept and importance of gender sensitivity and equality.</li> <li>• Discuss ways to create sensitivity for different genders and Persons with Disabilities (PwD).</li> </ul>	<ul style="list-style-type: none"> <li>• Develop a sample plan to achieve organisational goals and targets.</li> <li>• Create a sample feedback form to obtain feedback from customers, colleagues etc.</li> <li>• Roleplay to demonstrate the use of professional language and behaviour that is respectful of PwD and all genders.</li> <li>• Apply organisational protocol on data confidentiality and sharing only with the authorised personnel.</li> </ul>

<ul style="list-style-type: none"><li>• Discuss ways of dealing with heightened emotions of self and others.</li></ul>	
<b>Classroom Aids</b>	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
<b>Tools, Equipment and Other Requirements</b>	
Sample Of Escalation Matrix, Organization Structure.	

## Module 5: Basic Health and Safety Practice

*Mapped to ELE/N1002 v2.0*

### Terminal Outcomes:

- Apply health and safety practices at the workplace.

Duration: 15:00	Duration: 15:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> <li>• Discuss job-site hazards, risks and accidents.</li> <li>• Explain the organizational safety procedures for maintaining electrical safety, handling tools and hazardous materials.</li> <li>• Elaborate on electronic waste disposal procedures.</li> <li>• Describe the process of disposal of hazardous waste</li> <li>• List the name and location of concerned people, documents and equipment for maintaining health and safety in the workplace.</li> <li>• Describe how to interpret warning signs while accessing sensitive work areas.</li> <li>• Explain the importance of good housekeeping.</li> <li>• Describe the importance of maintaining appropriate postures while lifting heavy objects.</li> <li>• List the types of fire and fire extinguishers.</li> <li>• Explain the importance of efficient utilisation of water, electricity and other resources.</li> <li>• List the common sources of pollution and ways to minimize it.</li> <li>• Describe the concept of waste management and methods of disposing hazardous waste.</li> <li>• Explain various warning and safety signs.</li> <li>• Describe different ways of preventing accidents at the workplace.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate the use of protective equipment suitable as per tasks and work conditions.</li> <li>• Prepare a report to inform the relevant authorities about any abnormal situation/behaviour of any equipment/system.</li> <li>• Administer first aid in case of a minor accident.</li> <li>• Demonstrate the steps to free a person from electrocution safely.</li> <li>• Administer Cardiopulmonary Resuscitation (CPR).</li> <li>• Demonstrate the application of defined emergency procedures such as raising alarm, safe/efficient, evacuation, moving injured people, etc.</li> <li>• Prepare a sample incident report.</li> <li>• Use a fire extinguisher in case of a fire incident.</li> <li>• Demonstrate the correct method of lifting and handling heavy objects.</li> </ul>

<b>Classroom Aids</b>
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop
<b>Tools, Equipment and Other Requirements</b>
Personal Protection Equipment: Safety Glasses, Head Protection, Rubber Gloves, Safety Footwear, Warning Signs and Tapes, Fire Extinguisher, First Aid Kit, Fire Extinguishers and Warning Signs.

## Module 6: Employability Skills (60 Hours) Mapped to DGT/VSQ/N0102

### Terminal Outcomes:

- Discuss about Employability Skills in meeting the job requirements
- Describe opportunities as an entrepreneur.
- Describe ways of preparing for apprenticeship & Jobs appropriately.

<b>Duration: 24:00</b>	<b>Duration: 36:00</b>
<b>Theory – Key Learning Outcomes</b>	<b>Practical – Key Learning Outcomes</b>
<ul style="list-style-type: none"> <li>• Explain constitutional values, civic rights, responsibility towards society to become a responsible citizen</li> <li>• Discuss 21<sup>st</sup> century skills</li> <li>• Explain use of basic English phrases and sentences.</li> <li>• Demonstrate how to communicate in a well-behaved manner</li> <li>• Demonstrate how to work with others</li> <li>• Demonstrate how to operate digital devices</li> <li>• Discuss the significance of Internet and Computer/ Laptops</li> <li>• Discuss the need for identifying business opportunities</li> <li>• Discuss about types of customers.</li> <li>• Discuss on creation of biodata</li> <li>• Discuss about apprenticeship and opportunities related to it.</li> </ul>	<ul style="list-style-type: none"> <li>• List different learning and employability related GOI and private portals and their usage</li> <li>• Show how to practice different environmentally sustainable practices.</li> <li>• Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, etc.</li> <li>• Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone</li> <li>• Demonstrate how to communicate in a well-mannered way with others.</li> <li>• Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette</li> <li>• Utilize virtual collaboration tools to work effectively</li> <li>• Demonstrate how to maintain hygiene and dressing appropriately.</li> <li>• Perform a mock interview</li> </ul>
<b>Classroom Aids</b>	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
<b>Tools, Equipment and Other Requirements</b>	
Computer, UPS, Scanner, Computer Tables, LCD Projector, Computer Chairs, White Board OR Computer Lab	

## Module 7: On-the-Job Training

### Mapped to Solar Panel Installation Technician

<b>Mandatory Duration: 150:00</b>	<b>Recommended Duration: 00:00</b>
<b>Location: On Site</b>	
<p><b>Terminal Outcomes</b></p> <ol style="list-style-type: none"> <li>1. Explain the use and handling procedure of solar panels.</li> <li>2. Assess the degree of inclination and angle of tilt of PV module for the specific area, locality or region to enable the system absorb maximum annual sunlight.</li> <li>3. set the mounting fixture firmly at the desired location.</li> <li>4. Install spare fuse to avoid any short circuits as per company policy.</li> <li>5. Connect multiple PV modules in combination to generate the desired voltage and current.</li> <li>6. Connect the system and check its functioning.</li> <li>7. Dispose-off any waste materials in accordance with safe working practices and procedures.</li> <li>8. Develop a sample plan to achieve organisational goals and targets.</li> <li>9. Demonstrate the use of professional language and behaviour that is respectful of PwD and all genders.</li> <li>10. Use the protective equipment suitable as per tasks and work conditions.</li> <li>11. Administer first aid in case of a minor accident.</li> <li>12. Use a fire extinguisher in case of a fire incident.</li> </ol>	

# Annexure

## Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Years	Specialization	Years	Specialization	
Diploma/ ITI/ Certified in relevant CITS course	Electrical/ Electronics/ Mechanical	1	Solar Panel Installation	1 year preferably	Electronics	

Trainer Certification	
Domain Certification	Platform Certification
“Solar Panel Installation Technician”, “ELE/Q5901, v3.0”, Minimum accepted score is 80%	“Trainer”, “MEP/Q2601” with a minimum score of 80%

## Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	Specialization	Years	Specialization	
Diploma/ ITI/ Certified in relevant CITS course	Electrical/ Electronics/ Mechanical	2	Solar Panel Installation	1 year preferably	Electronics	

Assessor Certification	
Domain Certification	Platform Certification
“Solar Panel Installation Technician”, “ELE/Q5901, v3.0”, Minimum accepted score is 80%	“Assesor”, “MEP/Q2701” with a minimum score of 80%

## Assessment Strategy

### 1. Assessment System Overview:

- Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
- Assessment agencies send the assessment confirmation to VTP/TC looping SSC
- The assessment agency deploys the ToA certified Assessor for executing the assessment
- SSC monitors the assessment process & records

### 2. Testing Environment

To ensure a conducive environment for conducting a test, the trainer will:

- Confirm that the centre is available at the same address as mentioned on SDMS or SIP
- Check the duration of the training.
- Check the Assessment Start and End time to be 10 a.m. and 5 p.m. respectively
- Ensure there are 2 Assessors if the batch size is more than 30.
- Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
- Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
- Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
- Check the availability of the Lab Equipment for the particular Job Role.

### 3. Assessment Quality Assurance levels / Framework:

- Question papers created by the Subject Matter Experts (SME)
- Question papers created by the SME verified by the other subject Matter Experts
- Questions are mapped with NOS and PC
- Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
- The assessor must be ToA certified and the trainer must be ToT Certified
- The assessment agency must follow the assessment guidelines to conduct the assessment

### 4. Types of evidence or evidence-gathering protocol:

- Time-stamped & geotagged reporting of the assessor from assessment location
- Centre photographs with signboards and scheme-specific branding
- Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
- Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos

### 5. Method of verification or validation:

To verify the details submitted by the training centre, the assessor will undertake:

- A surprise visit to the assessment location
- A random audit of the batch
- A random audit of any candidate

### 6. Method for assessment documentation, archiving, and access

To protect the assessment papers and information, the assessor will ensure:

- Hard copies of the documents are stored

- Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage
- Soft copies of the documents & photographs of the assessment are stored on the Hard drive

# References

## Glossary

Term	Description
<b>Declarative knowledge</b>	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
<b>Key Learning</b>	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
<b>OJT (M)</b>	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
<b>OJT (R)</b>	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
<b>Procedural Knowledge</b>	Procedural knowledge addresses how to do something, or how to perform a
<b>Training Outcome</b>	Training outcome is a statement of what a learner will know, understand and be able to do <b>upon the completion of the training.</b>
<b>Terminal Outcome</b>	Terminal outcome is a statement of what a learner will know, understand and be able to do <b>upon the completion of a module.</b> A set of terminal outcomes help to achieve the training outcome.

## Acronyms and Abbreviations

Term	Description
ISO	International Organization for Standardization
NCO	National Occupational Standards
NOS	National Skills Qualification Committee
NSQF	National Skills Qualification Framework
OJT	On-the-Job Training
OMR	Optical Mark Recognition
PC	Performance Criteria
PwD	Persons with Disabilities
QP	Qualification Pack
SDMS	Skill Development & Management System
SIP	Skill India Portal
SME	Small and Medium Enterprises
SOP	Standard Operating Procedure
SSC	Sector Skill Council
TC	Trainer Certificate
ToA	Training of Assessors
ToT	Training of Trainers
TP	Training Provider