Qualification Pack

Solar PV Installer (Suryamitra)

QP Code: SGJ/Q0101

Version: 4.0

NSQF Level: 4

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Qualification Pack

SGJ/Q0101: Solar PV Installer (Suryamitra)

Brief Job Description

Solar PV installer checks, adapts, implements, configure, install, inspects, tests and commissions different components of photovoltaic system, that meet the performance and reliability needs of customer by incorporating quality craftmanship and complying with all applicable codes, standards and safety requirements

Personal Attributes

This job requires the individual to be diligent, organised, punctual, attentive and accountable to complete the work at site safely and timely. The individual must also demonstrate strong work ethics, good communication skills and should have an ability to properly follow the instructions of supervisor.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. SGJ/N0101: Site survey for installation of solar PV system
2. SGJ/N0102: Procure Solar PV system components
3. SGJ/N0103: Install civil and mechanical parts of Solar PV system
4. SGJ/N0104: Installation of electrical components of a solar PV system
5. SGJ/N0105: Test and commission Solar PV system
6. SGJ/N0622: Maintain Solar Photovoltaic Power System
7. SGJ/N0106: Maintain Personal Health & Safety at project site
8. SGJ/N0107: Customer orientation for Solar PV System
9. DGT/VSQ/N0102: Employability Skills (60 Hours)

Qualification Pack (QP) Parameters

Sector	Green Jobs
Sub-Sector	Renewable Energy
Occupation	Solar Panel Installation Technician

Qualification Pack

Country	India
NSQF Level	4
Credits	14
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7421.1401
Minimum Educational Qualification & Experience	12th grade Pass (Science) + or Equivalent) with NA of experience OR 10th grade pass with 3 Years of experience Renewable energy/power sector experience OR 10th grade pass (2 years of any combination of NTC/NAC/CITS or equivalent in relevant trade) with NA of experience OR Previous relevant Qualification of NSQF Level (3.5 Solar PV Site Survey Assistant)) OR Previous relevant Qualification of NSQF Level (3.0 Assistant Technician – Solar Panel Installation) with 3 Years of experience Renewable energy/power sector experience
Minimum Level of Education for Training in School	Not Applicable
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	NA
Next Review Date	30/05/2027
NSQC Approval Date	30/05/2024
Version	4.0
Reference code on NQR	QG-04-ES-02628-2024-V2-SCGJ
NQR Version	2

Remarks:

Total 420 Notional hours i.e. 14 Credits (including Theory : 210 + Practical : 150 + OJT : 60)

SGJ/N0101: Site survey for installation of solar PV system

Description

This unit is about the survey of site for installation of solar photovoltaic plant.

Scope

The scope covers the following :

- Roles and responsibilities of a Solar PV Installer
- Discuss solar energy concepts
- Assess the site conditions
- Identify load to be connected to solar PV system
- Material conservation and use of environment friendly materials

Elements and Performance Criteria

Introduction to Solar PV Installer Course

To be competent, the user/individual on the job must be able to:

PC1. explain the role of a Solar PV Installer and emerging jobs & entrepreneurial opportunities.

PC2. illustrate the advantages of doing this course.

PC3. explain the importance of basic skills for communication; along with how to work effectively with others while respecting gender and disability concerns.

PC4. explain the importance of reading and interpreting signs, notices and/or cautions at project site.

PC5. demonstrate general discipline during the training program.

PC6. demonstrate how to interpret signs, notices and/or cautions at project site.

Basics of Solar Energy and Electrical Concepts

To be competent, the user/individual on the job must be able to:

PC7. explain Ohm’s Law.

PC8. explain the basics of solar energy/ electricity and electrical concepts.

PC9. explain the relevance of Diffused Normal Irradiance (DNI) and Global Horizontal Irradiance (GHI) along with differences in Irradiance & Irradiation.

PC10. illustrate the movement of the sun and assess its effect on the performance of the solar power plant.

PC11. perform simple calculations to illustrate the fundamental concepts of power and energy.

PC12. demonstrate how the movement of sun affects the performance of the solar power plant.

Site Survey for Installation of Solar PV System and asses the customer’s Solar PV Requirement

To be competent, the user/individual on the job must be able to:

PC13. describe how to observe Sun path diagram and explain the importance of shading analysis.

PC14. explain the importance of assessing various site conditions for safe installation of solar PV system.

PC15. assess the location, any site level pre- requisites and optimise the route plan.

PC16. identify and list the load to be connected to the Solar PV system.

PC17. describe load profile.

PC18. explain the importance of engaging with customers for any specific requirement and budget constraints while identifying opportunities for deploying innovative energy solution like ''Plug and Play'' or ''Behind the Meter'' solution, where typical civil construction work may not be required.

PC19. describe the importance of system sizing and explain its calculation with basic mathematical tools.

PC20. explain how to prepare a site map.

PC21. explain the use of Software tools/App for performing Site survey.

PC22. explain how to use Google Earth for generating KMZ file and estimating the Area for the solar installation.

PC23. explain how to read the Electricity bill.

PC24. demonstrate how to observe Sun path diagram and perform shading analysis.

PC25. demonstrate how to assess the site conditions for safe installation of Solar PV system and optimise route plan.

PC26. demonstrate how to assess the load to be connected to the Solar PV system and how to prepare the load profile.

PC27. demonstrate how to engage with customers to meet their energy requirements, including through deploying innovative energy solutions like ''behind the meter'' system.

PC28. perform system sizing calculations.

PC29. show how to prepare a site map of the location where installation has to be carried out.

PC30. show how to decide on type of mounting to be created and explain customers about any civil work to be undertaken.

PC31. show how to identify processes where material/resource utilization including water can be optimized.

PC32. demonstrate how to generate KMZ file.

PC33. demonstrate how to use PV Syst/Sketchup for Site survey and shadow analysis.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. company's installation policy

KU2. company's customer support policy

KU3. authority of Specified Field Safety Officer and Supervisor

KU4. company's reporting structure

KU5. general terminologies associated with solar power plant

KU6. basic concepts of trigonometry and coordinate geometry

KU7. units and symbols for irradiation and irradiance

KU8. effect on array output of current and voltage based on series / parallel connections of modules, tilt angle, orientation and shading

KU9. simple calculations to derive the power and energy received from solar radiation in a given area

KU10. efficiency, cost and typical specifications, functioning and operating principle of different types of solar photovoltaic plants, commercially available pv modules, inverters, charge controllers, battery, mounting structures, cables, junction boxes and other components

KU11. mechanical and electrical features necessary for the long life of the pv power plant under a wide range of operating conditions

KU12. latest technologies used in system configurations like plug and play or behind the meter systems

KU13. basics of how to use google earth as a tools for site survey, KMZ file preparation

KU14. reporting protocol and documentation required

KU15. parameters and data required for material and energy audit

KU16. latest methods of energy and material conservation

KU17. environment friendly materials available to replace conventional materials

KU18. methods of reducing electrical consumption

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read vernacular/English language

GS2. read and understand manuals, health and safety instructions, memos, other company documents

GS3. read from different sources- books, screens in machines and signage

GS4. identify various colour codes as per standard electrical, mechanical and civil nomenclature

GS5. express statements or information clearly so that others can hear and understand

GS6. participate in and understand the main points of simple discussions

GS7. respond appropriately to any queries

GS8. communicate with Supervisor

GS9. follow organization rule-based decision making process

GS10. take decision with systematic course of actions and/or response

GS11. organize work to meet deadlines

GS12. work constructively and collaboratively with others

GS13. follow code of conduct

GS14. manage relationships with customers with intent on satisfying requirements of service delivery

GS15. recognize problems and search for solutions

GS16. choose best methods to complete assigned tasks

GS17. approach relevant authority when required

GS18. apply domain knowledge

GS19. evaluate information obtained from customers, supervisor and co-workers

GS20. communicate with team members and colleagues on the significance of greening of jobs

GS21. make timely decisions for efficient utilization of resources
GS22. practice and accept gender equality and disability in team
GS23. communicate with industries and customers to understand market

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction to Solar PV Installer Course	**12**	**7**	**-**	**-**
PC1. explain the role of a Solar PV Installer and emerging jobs & entrepreneurial opportunities.	3	-	-	-
PC2. illustrate the advantages of doing this course.	3	-	-	-
PC3. explain the importance of basic skills for communication; along with how to work effectively with others while respecting gender and disability concerns.	3	-	-	-
PC4. explain the importance of reading and interpreting signs, notices and/or cautions at project site.	3	-	-	-
PC5. demonstrate general discipline during the training program.	-	3	-	-
PC6. demonstrate how to interpret signs, notices and/or cautions at project site.	-	4	-	-
Basics of Solar Energy and Electrical Concepts	**12**	**6**	**-**	**-**
PC7. explain Ohm's Law.	3	-	-	-
PC8. explain the basics of solar energy/ electricity and electrical concepts.	3	-	-	-
PC9. explain the relevance of Diffused Normal Irradiance (DNI) and Global Horizontal Irradiance (GHI) along with differences in Irradiance & Irradiation.	3	-	-	-
PC10. illustrate the movement of the sun and assess its effect on the performance of the solar power plant.	3	-	-	-
PC11. perform simple calculations to illustrate the fundamental concepts of power and energy.	-	3	-	-
PC12. demonstrate how the movement of sun affects the performance of the solar power plant.	-	3	-	-
Site Survey for Installation of Solar PV System and asses the customer's Solar PV Requirement	**33**	**30**	**-**	**-**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. describe how to observe Sun path diagram and explain the importance of shading analysis.	3	-	-	-
PC14. explain the importance of assessing various site conditions for safe installation of solar PV system.	3	-	-	-
PC15. assess the location, any site level pre-requisites and optimise the route plan.	3	-	-	-
PC16. identify and list the load to be connected to the Solar PV system.	3	-	-	-
PC17. describe load profile.	3	-	-	-
PC18. explain the importance of engaging with customers for any specific requirement and budget constraints while identifying opportunities for deploying innovative energy solution like ''Plug and Play'' or ''Behind the Meter'' solution, where typical civil construction work may not be required.	3	-	-	-
PC19. describe the importance of system sizing and explain its calculation with basic mathematical tools.	3	-	-	-
PC20. explain how to prepare a site map.	3	-	-	-
PC21. explain the use of Software tools/App for performing Site survey.	3	-	-	-
PC22. explain how to use Google Earth for generating KMZ file and estimating the Area for the solar installation.	3	-	-	-
PC23. explain how to read the Electricity bill.	3	-	-	-
PC24. demonstrate how to observe Sun path diagram and perform shading analysis.	-	3	-	-
PC25. demonstrate how to assess the site conditions for safe installation of Solar PV system and optimise route plan.	-	3	-	-
PC26. demonstrate how to assess the load to be connected to the Solar PV system and how to prepare the load profile.	-	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC27. demonstrate how to engage with customers to meet their energy requirements, including through deploying innovative energy solutions like ''behind the meter'' system.	-	3	-	-
PC28. perform system sizing calculations.	-	3	-	-
PC29. show how to prepare a site map of the location where installation has to be carried out.	-	3	-	-
PC30. show how to decide on type of mounting to be created and explain customers about any civil work to be undertaken.	-	3	-	-
PC31. show how to identify processes where material/resource utilization including water can be optimized.	-	3	-	-
PC32. demonstrate how to generate KMZ file.	-	3	-	-
PC33. demonstrate how to use PV Syst/Sketchup for Site survey and shadow analysis.	-	3	-	-
NOS Total	**57**	**43**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	SGJ/N0101
NOS Name	Site survey for installation of solar PV system
Sector	Green Jobs
Sub-Sector	Renewable Energy
Occupation	Site survey, Solar Panel Installation Technician
NSQF Level	4
Credits	2
Version	5.0
Last Reviewed Date	30/05/2024
Next Review Date	29/05/2027
NSQC Clearance Date	30/05/2024

SGJ/N0102: Procure Solar PV system components

Description

This unit is about procurement of PV system component while confirming and adapting to system design

Scope

The scope covers the following :

- Discuss system components and manufacturer specification sheet
- Prepare Bill of Material
- Procure the components
- Verify the components on-site
- Material conservation and use of environment friendly materials

Elements and Performance Criteria

Basics of Solar Photovoltaic system and its Components

To be competent, the user/individual on the job must be able to:

PC1. explain various terminologies used in the solar industry.

PC2. identify the different components of a Solar PV system and explain its basic operation.

PC3. explain various Solar PV cell technologies - Mono & Poly Crystalline.

PC4. explain the working of different types of Solar PV systems.

PC5. discuss the latest and innovative technologies used in system configurations like ''Plug & Play'' or ''Behind the Meter'' energy systems.

PC6. describe the different types, sizes and specifications of modules, inverters, charge controllers, cables, conduits, junction boxes, solar batteries and allied accessories and analyse the different types, sizes and specifications of solar modules, inverters, charge controllers, cables, conduits, junction boxes, solar batteries and allied accessories

PC7. explain about the manufacturing data specification sheets of different types of solar PV components and analyse the manufacturing data specification sheets of different types of solar PV components.

Interpretation of Drawings, Material Handling and storage of components on-site

To be competent, the user/individual on the job must be able to:

PC8. explain the importance of reading and rightly interpreting Single Line Diagram (SLD), Layout Diagrams, Civil/Mechanical and Electrical Drawings and demonstrate how to read and rightly interpret Single Line Diagram (SLD), Layout Diagrams, Civil/Mechanical and Electrical Drawings.

PC9. describe the DO's and Don'ts of material handling and demonstrate the process of safe material handling.

PC10. explain how to read and interpret the Bill of Material to verify with the delivery of components on-site and show how to check materials received as per final BoM to ensure that the correct material for the job arrives on site and is damage free.

PC11. explain how to ensure that all the components are handled and stored properly as per standard operating procedures.

PC12. describe the importance of Preparing Bill of Materials (BoM) including for portable and innovative solutions like Plug & Play or Behind the Meter system and demonstrate how to prepare Bill of Materials for solar PV system, including for innovative solutions like Plug & Play or Behind the Meter system.

PC13. explain how to approach organization's warehouse/vendors, suppliers and/or manufacturers to place the order for components as per BoM.

PC14. discuss how to ensure quantity of modules / panels, inverters etc matches with the requirement of the system and Show how to ensure that all materials are QC passed.

PC15. identify and list any variation is material specification and design and explain how to submit the documented variation to design team (if required) for approval or revised drawings and Show how to report and document the status of material received at site and take appropriate action for replacements, if any

PC16. introduce basics of Inventory management tools and its importance.

PC17. identify materials which can be replaced by environment friendly substitutes and identify processes where material utilization can be optimized and accordingly suggest those to higher authority.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. company's installation policy

KU2. company's customer support policy

KU3. company's documentation policy

KU4. authority of specified Field Safety Officer and Supervisor

KU5. company's reporting structure

KU6. organizational culture

KU7. general terminologies associated with solar power plant

KU8. units and symbols for irradiation and irradiance

KU9. effect on array output of current and voltage based on series / parallel connections of modules, tilt angle, orientation and shading

KU10. simple calculations to derive the power and energy received from solar radiation in a given area

KU11. efficiency, cost and typical specifications functioning and operating principle of different types of commercially available photovoltaic modules, inverters, charge controllers, battery, mounting structures, cables, junction boxes and other components

KU12. mechanical and electrical features necessary for the long life of the PV system under a wide range of operating conditions

KU13. cabling route and length of cable requirement

KU14. labelling of PV system components

KU15. warranty documents of each component of the solar PV system

KU16. latest methods of energy and material conservation

KU17. environment friendly materials available to replace conventional materials

KU18. methods of reducing electrical consumptions

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read English and/or vernacular language
GS2. read and understand manuals, health and safety instructions, memos, other company documents
GS3. read from different sources- books screens in machines and signage
GS4. read various color codes, as per standard electrical, mechanical and civil nomenclature
GS5. express statements or information clearly so that others can hear and understand
GS6. participate in and understand the main points of simple discussions
GS7. respond appropriately to any queries
GS8. communicate with supervisor
GS9. follow organizational rule-based decision making process
GS10. take decision as per systematic course of actions
GS11. organize work to meet deadlines
GS12. work constructively and collaboratively with others
GS13. follow code of conduct
GS14. manage relationships with customers with intent on satisfying its requirements for service delivery
GS15. choose best methods to complete assigned tasks
GS16. apply domain knowledge, observations and data to select course of action to perform tasks related to solar photovoltaic systems
GS17. evaluate information obtained from customers, supervisor and co-workers to perform day to day activities
GS18. ask questions for better understanding
GS19. communicate with industries and customers to understand and analyze various strategies, demands and limitations in the market
GS20. demonstrate effective time and resource management techniques along with entrepreneurship skills
GS21. communicate with team members and colleagues on the significance of greening of jobs
GS22. make timely decisions for efficient utilization of resources

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Basics of Solar Photovoltaic system and its Components	**14**	**4**	**-**	**-**
PC1. explain various terminologies used in the solar industry.	2	-	-	-
PC2. identify the different components of a Solar PV system and explain its basic operation.	2	-	-	-
PC3. explain various Solar PV cell technologies - Mono & Poly Crystalline.	2	-	-	-
PC4. explain the working of different types of Solar PV systems.	2	-	-	-
PC5. discuss the latest and innovative technologies used in system configurations like ''Plug & Play'' or ''Behind the Meter'' energy systems.	2	-	-	-
PC6. describe the different types, sizes and specifications of modules, inverters, charge controllers, cables, conduits, junction boxes, solar batteries and allied accessories and analyse the different types, sizes and specifications of solar modules, inverters, charge controllers, cables, conduits, junction boxes, solar batteries and allied accessories	2	2	-	-
PC7. explain about the manufacturing data specification sheets of different types of solar PV components and analyse the manufacturing data specification sheets of different types of solar PV components.	2	2	-	-
Interpretation of Drawings, Material Handling and storage of components on-site	**18**	**14**	**-**	**-**
PC8. explain the importance of reading and rightly interpreting Single Line Diagram (SLD), Layout Diagrams, Civil/Mechanical and Electrical Drawings and demonstrate how to read and rightly interpret Single Line Diagram (SLD), Layout Diagrams, Civil/Mechanical and Electrical Drawings.	2	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. describe the DO's and Don'ts of material handling and demonstrate the process of safe material handling.	2	2	-	-
PC10. explain how to read and interpret the Bill of Material to verify with the delivery of components on-site and show how to check materials received as per final BoM to ensure that the correct material for the job arrives on site and is damage free.	2	2	-	-
PC11. explain how to ensure that all the components are handled and stored properly as per standard operating procedures.	2	-	-	-
PC12. describe the importance of Preparing Bill of Materials (BoM) including for portable and innovative solutions like Plug & Play or Behind the Meter system and demonstrate how to prepare Bill of Materials for solar PV system, including for innovative solutions like Plug & Play or Behind the Meter system.	2	2	-	-
PC13. explain how to approach organization's warehouse/vendors, suppliers and/or manufacturers to place the order for components as per BoM.	2	-	-	-
PC14. discuss how to ensure quantity of modules / panels, inverters etc matches with the requirement of the system and Show how to ensure that all materials are QC passed.	2	2	-	-
PC15. identify and list any variation is material specification and design and explain how to submit the documented variation to design team (if required) for approval or revised drawings and Show how to report and document the status of material received at site and take appropriate action for replacements, if any	2	2	-	-
PC16. introduce basics of Inventory management tools and its importance.	2	-	-	-
PC17. identify materials which can be replaced by environment friendly substitutes and identify processes where material utilization can be optimized and accordingly suggest those to higher authority.	-	2	-	-
NOS Total	**32**	**18**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	SGJ/N0102
NOS Name	Procure Solar PV system components
Sector	Green Jobs
Sub-Sector	Renewable Energy
Occupation	Procurement, Procurement, Technician, Solar Panel Installation Technician
NSQF Level	4
Credits	2
Version	5.0
Last Reviewed Date	30/05/2024
Next Review Date	29/05/2027
NSQC Clearance Date	30/05/2024

SGJ/N0103: Install civil and mechanical parts of Solar PV system

Description

This unit is about installation of civil and mechanical components of the Solar Photovoltaic systems (for rooftop installations).

Scope

The scope covers the following :

- Construction of equipment foundation
- Install mounting system
- Install photovoltaic modules
- Install battery bank stand and inverter stand
- Material conservation practices
- Effective waste management/recycling practices

Elements and Performance Criteria

Identification and Use of different tools and tackles used for installation of solar PV system

To be competent, the user/individual on the job must be able to:

PC1. explain about the different tools & tackles used for specific purpose in an installation of Solar PV system and demonstrate the function of different tools & tackles used for specific purpose in an installation of Solar PV system.

PC2. explain the process of installing the mounting structure along with structural supports and accessories for safe & weatherproof installation as per site conditions and demonstrate the process of installing the entire mounting structure/system along with structural supports and accessories for safe & weatherproof installation as per site conditions.

PC3. identify and describe various tools & tackles used for civil/mechanical installation and demonstrate how to use various tools and tackles for civil/mechanical installation and identify best practices.

PC4. show how to install modules as per lay out diagram and fasten modules to structures.

PC5. identify opportunities for material and energy conservation, along with use of environmentally friendly materials in civil/mechanical installation.

PC6. demonstrate how to install battery bank as per drawings/manuals.

PC7. explain and show how to follow waste management practices and Demonstrate process for optimising the usage of material and energy conservation, along with promoting the use of environmentally friendly.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. government/corporate policies and guidelines on: workplace safety, identification and mitigation of safety hazards, work procedures and guidelines for working at height

KU2. document information using appropriate forms
KU3. authorization from specified field safety officer and supervisor
KU4. legislative, organization, site requirements and procedures
KU5. environmental clearance requirements
KU6. work in varying weather conditions
KU7. document information using appropriate forms
KU8. tools required for installation
KU9. effect on array output of current and voltage based on series / parallel connections of modules, tilt angle, orientation and shading
KU10. document information using appropriate forms
KU11. document information using appropriate forms
KU12. type of mounting structure required depending upon the type of roof
KU13. type of footings and fixtures required depending upon the type of roof
KU14. any shading effect on the solar power system
KU15. the cabling route and estimate the length of cable required
KU16. the array junction box (if required) and inverter will be located
KU17. dos and dont's of material handling and storage
KU18. installation work on a PV power system in accordance with relevant standards and regulations
KU19. occupational health and safety (OHS) standards and associated risks when working on that particular site
KU20. latest technologies used in system configurations like plug and play or behind the meter systems
KU21. latest methods of energy and material conservation
KU22. environment friendly materials available to replace conventional materials
KU23. organization's procedures for minimizing waste
KU24. efficient and inefficient utilization of material and water
KU25. ways of efficiently managing material and water in the process
KU26. identify recyclable and non-recyclable, and hazardous waste generated

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. complete documentation applicable to the role
GS2. read english and/or vernacular language
GS3. read and understand manuals, health and safety instructions, memos, other company documents
GS4. read different signage
GS5. understand the various color codes, as per standard electrical, mechanical and civil nomenclature
GS6. express statements or information clearly so that others can hear and understand

GS7. participate in and understand the main points of simple discussions
GS8. respond appropriately to any queries
GS9. communicate with supervisor
GS10. follow organization's rule-based decision making process
GS11. plan and organize work to meet deadlines
GS12. collaborate and work constructively with others
GS13. follow code of conduct
GS14. manage relationships with customers with intent on satisfying its requirements for service delivery
GS15. recognize problems and search for solutions
GS16. choose best methods to complete assigned tasks
GS17. approach relevant authority when required
GS18. apply domain knowledge, observations and data to select course of action to perform tasks related to Solar Photovoltaic systems
GS19. evaluate critical information obtained from customers, supervisor and co-workers to perform day to day activities
GS20. ask questions for better understanding
GS21. record data relevant to waste disposal at workplace
GS22. complete statutory documents relevant to safety and hygiene
GS23. make timely decisions for efficient utilization of resources

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Identification and Use of different tools and tackles used for installation of solar PV system	**20**	**30**	**-**	**-**
PC1. explain about the different tools & tackles used for specific purpose in an installation of Solar PV system and demonstrate the function of different tools & tackles used for specific purpose in an installation of Solar PV system.	4	5	-	-
PC2. explain the process of installing the mounting structure along with structural supports and accessories for safe & weatherproof installation as per site conditions and demonstrate the process of installing the entire mounting structure/system along with structural supports and accessories for safe & weatherproof installation as per site conditions.	4	5	-	-
PC3. identify and describe various tools & tackles used for civil/mechanical installation and demonstrate how to use various tools and tackles for civil/mechanical installation and identify best practices.	4	4	-	-
PC4. show how to install modules as per lay out diagram and fasten modules to structures.	-	5	-	-
PC5. identify opportunities for material and energy conservation, along with use of environmentally friendly materials in civil/mechanical installation.	5	-	-	-
PC6. demonstrate how to install battery bank as per drawings/manuals.	-	5	-	-
PC7. explain and show how to follow waste management practices and Demonstrate process for optimising the usage of material and energy conservation, along with promoting the use of environmentally friendly.	3	6	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	SGJ/N0103
NOS Name	Install civil and mechanical parts of Solar PV system
Sector	Green Jobs
Sub-Sector	Renewable Energy
Occupation	Installation, Solar Panel Installation Technician
NSQF Level	4
Credits	1
Version	4.0
Last Reviewed Date	30/05/2024
Next Review Date	30/05/2027
NSQC Clearance Date	30/05/2024

SGJ/N0104: Installation of electrical components of a solar PV system

Description

This unit is about installation of electrical components of the solar photovoltaic system.

Scope

The scope covers the following :

- Prepare for solar installation
- Install electrical components
- Install conduits and cables ensuring minimum wastage of materials
- Install battery bank (as required)
- Perform electrical grounding and install earthing and lightening arrestor
- Post work activities

Elements and Performance Criteria

Installation of Electrical components of a Solar PV System

To be competent, the user/individual on the job must be able to:

PC1. discuss how to implement site safety plan and inspect & utilise electrical installation toolkit and demonstrate how to install electrical components of solar PV system; including inverter, batteries, junction boxes, energy meters, cables and conduits other electrical components.

PC2. identify tools and tackles for electrical component installation for Solar PV Power plant and demonstrate the application of tools & tackles used for cable and conduit installation.

PC3. describe the process of installing the electrical components including inverter, batteries, junction boxes, energy meters, cables and conduits other electrical components.

PC4. explain the Do’s and Don’ts of DC wiring and analyse how to perform DC wiring.

PC5. identify tools & tackles used for cable and conduit installation.

PC6. discuss and show how to ensure that the conduits and cables are properly supported, secured and labelled and demonstrate the application of tools & tackles used for cable and conduit installation.

PC7. describe the importance of Earthing for the protection of solar PV system and demonstrate how to perform earthing and grounding work for the protection of solar PV system.

PC8. explain the significance and types of earth faults as per standards.

PC9. explain the de-mounting of a solar PV power plant (after commissioning) and demonstrate demounting of solar PV power plant.

PC10. discuss function and installation of Remote monitoring unit, Temperature and radiation sensor.

PC11. show how to clean the work area after completing the installation work.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. government/corporate policies and guidelines on: workplace safety, identification and mitigation of safety hazards, work procedures and guidelines for working at height

KU2. information using appropriate corporate forms

KU3. authorization required from specified field safety officer and supervisor

KU4. legislative, organizational, site requirements and procedures

KU5. diagnostic/fault finding techniques

KU6. the environmental requirements

KU7. how to work in varying weather conditions

KU8. isolation procedures

KU9. tools and tackles required for installation

KU10. effect on array output of current and voltage based on series / parallel connections of modules, tilt angle, orientation and shading

KU11. efficiency, cost, typical specifications, functioning and operating principle of different types of commercially available pv modules, inverters, charge controllers, battery, cables, junction boxes and other electrical components

KU12. mechanical and electrical features necessary for the long life of the pv system under a wide range of operating conditions

KU13. dos and dont's of material handling and storage

KU14. whether any shading will occur and estimate its effect on the system

KU15. measuring solar irradiance with a pyranometer

KU16. effect of blocking and bypass diodes

KU17. basic functioning and operation of different types of inverters and other electrical components

KU18. do's and don'ts of DC wiring and installation of other electrical components

KU19. connection of the Solar Power Plant to the distribution box/ LT Panel and switchover along with precautions based on different types of plants

KU20. installation work on a solar power system in accordance with relevant standards and regulations

KU21. occupational health and safety (OHS) standards and associated risks when working on that particular site

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. complete documentation work applicable to the role

GS2. read English and/or vernacular language

GS3. read and understand manuals, health and safety instructions, memos, other company documents

GS4. read from different sources- books screens in machines and signage

GS5. read various color codes, as per standard electrical, mechanical and civil nomenclature

GS6. express statements or information clearly so that others can hear and understand

GS7. participate in and understand the main points of simple discussions

GS8. respond appropriately to any queries
GS9. communicate with supervisor
GS10. complete documentation work applicable to the role
GS11. take decision as per systematic course of actions
GS12. plan and organize work to meet deadlines
GS13. work constructively and collaboratively with others
GS14. follow code of conduct
GS15. recognize problems and search for solutions
GS16. choose best methods to complete assigned tasks
GS17. approach relevant authority when required
GS18. apply domain knowledge, observations and data to select course of action to perform tasks related to solar photovoltaic systems
GS19. evaluate information obtained from customers, supervisor and co-workers to perform day to day activities
GS20. ask questions for better understanding

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Installation of Electrical components of a Solar PV System	**25**	**25**	**-**	**-**
PC1. discuss how to implement site safety plan and inspect & utilise electrical installation toolkit and demonstrate how to install electrical components of solar PV system; including inverter, batteries, junction boxes, energy meters, cables and conduits other electrical components.	2	3	-	-
PC2. identify tools and tackles for electrical component installation for Solar PV Power plant and demonstrate the application of tools & tackles used for cable and conduit installation.	2	3	-	-
PC3. describe the process of installing the electrical components including inverter, batteries, junction boxes, energy meters, cables and conduits other electrical components.	2	-	-	-
PC4. explain the Do's and Don'ts of DC wiring and analyse how to perform DC wiring.	2	3	-	-
PC5. identify tools & tackles used for cable and conduit installation.	3	2	-	-
PC6. discuss and show how to ensure that the conduits and cables are properly supported, secured and labelled and demonstrate the application of tools & tackles used for cable and conduit installation.	3	3	-	-
PC7. describe the importance of Earthing for the protection of solar PV system and demonstrate how to perform earthing and grounding work for the protection of solar PV system.	2	3	-	-
PC8. explain the significance and types of earth faults as per standards.	3	-	-	-
PC9. explain the de-mounting of a solar PV power plant (after commissioning) and demonstrate demounting of solar PV power plant.	2	3	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. discuss function and installation of Remote monitoring unit, Temperature and radiation sensor.	4	-	-	-
PC11. show how to clean the work area after completing the installation work.	-	5	-	-
NOS Total	**25**	**25**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	SGJ/N0104
NOS Name	Installation of electrical components of a solar PV system
Sector	Green Jobs
Sub-Sector	Renewable Energy
Occupation	Installation, Installation, Solar Panel Installation Technician, Technician
NSQF Level	4
Credits	1
Version	4.0
Last Reviewed Date	30/05/2024
Next Review Date	29/05/2027
NSQC Clearance Date	30/05/2024

SGJ/N0105: Test and commission Solar PV system

Description

This unit is about testing and commissioning of electrical components of a solar photovoltaic system.

Scope

The scope covers the following :

- Test the system
- Commission the system

Elements and Performance Criteria

Test and Commission Solar PV system

To be competent, the user/individual on the job must be able to:

PC1. describe the importance of conducting visual inspection as part of pre commissioning activities and demonstrate how to perform testing of all components, along with fault finding & analysis, continuity checks, polarity check and other commissioning activities.

PC2. measure the Electrical data of string voltage, earthing.

PC3. explain how to prepare testing and inspection report and show how to perform visual inspection, inspect mechanical, civil and electrical components.

PC4. • perform the various test of all solar PV components:
• • Continuity Test,
• • Polarity check and other commissioning activities
• and show how to verify polarity and check continuity of the system.

PC5. show how to measure and verify inverter operation including anti islanding performance and measurement of AC system values, DC voltage, current in each string, and array for system operation.

PC6. show how to verify workmanship and proficiency is using tools and equipment.

PC7. explain the concerned regulations & standards for grid interconnection and examine concerned regulations & standards for grid interconnection.

PC8. show how to initiate system startup procedures, measure and record voltage and other parameters, record anomaly and document changes.

PC9. describe the commissioning process for the solar PV system and demonstrate the commissioning process for the Solar PV System.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. government/corporate policies and guidelines on: workplace safety, identification and mitigation of safety hazards, work procedures and guidelines for working at height

KU2. information using appropriate corporate forms

KU3. authorization from specified field safety officer and supervisor

KU4. legislative, organizational, site requirements and procedures
KU5. diagnostic/fault finding techniques
KU6. general terminologies associated with solar power plant
KU7. tools required for inspection and commissioning of the plant
KU8. effect on array output of current and voltage based on series / parallel connections of modules, tilt angle, orientation and shading
KU9. calculations to derive the power and energy received from solar radiation in a given area
KU10. efficiency, cost, typical specifications, functioning and operating principle of different types of commercially available PV modules, inverters, charge controllers, battery, cables, junction boxes and other electrical components
KU11. mechanical and electrical features necessary for the long life of the PV system under a wide range of operating conditions
KU12. type of mounting structure required depending on the type of roof
KU13. types of footing and fixtures required depending on the type of roof
KU14. dos and donts of material handling and storage
KU15. cabling route required
KU16. placement of array junction box and inverter
KU17. how to measure solar irradiance with a pyranometer
KU18. use of field measurements and sun path diagram
KU19. variation of current and voltage of a module w.r.t load
KU20. effect of blocking and bypass diodes
KU21. basic functioning and operation of different types of inverters and other electrical components
KU22. do's and don'ts of DC wiring and installation of other electrical components
KU23. connection of the Solar Power Plant to the distribution box/ LT Panel and switchover along with precautions based on different types of plants
KU24. installation work on a PV power system in accordance with relevant standards and regulations
KU25. testing and commissioning activities and its interpretation - visual inspection, continuity of wiring, earthing, polarity check, insulation and voltage drop
KU26. measurement of losses in a PV system at different points and interpretation of the results
KU27. typical faults, their causes and resolution for all system components
KU28. occupational health and safety (OHS) standards and associated risks when working on that particular site
KU29. statuary documentation relevant to safety and hygiene
KU30. compliance with all statutory and technical guidelines and best practices

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. complete documentation applicable to the role
GS2. read English and/or vernacular language

GS3. read and understand manuals, health and safety instructions, memos, other company documents

GS4. read from different sources- books screens in machines and signage

GS5. read various color codes, as per standard electrical, mechanical and civil nomenclature

GS6. express statements or information clearly so that others can hear and understand

GS7. participate in and understand the main points of simple discussions

GS8. respond appropriately to any queries

GS9. follow organization's rule-based decision making process

GS10. take decision with systematic course of actions and/or response

GS11. organize work to meet deadlines

GS12. work constructively and collaboratively with others

GS13. follow code of conduct

GS14. manage relationships with customers with intent on satisfying its requirements for service delivery

GS15. recognize problems

GS16. choose best methods to complete assigned tasks

GS17. approach relevant authority when required

GS18. apply domain knowledge, observations and data to select course of action to perform tasks related to solar photovoltaic systems

GS19. evaluate information obtained from customers, supervisor and co-workers to perform day to day activities

GS20. ask questions for better understanding

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Test and Commission Solar PV system	**20**	**30**	**-**	**-**
PC1. describe the importance of conducting visual inspection as part of pre commissioning activities and demonstrate how to perform testing of all components, along with fault finding & analysis, continuity checks, polarity check and other commissioning activities.	2	3	-	-
PC2. measure the Electrical data of string voltage, earthing.	4	-	-	-
PC3. explain how to prepare testing and inspection report and show how to perform visual inspection, inspect mechanical, civil and electrical components.	2	3	-	-
PC4. • perform the various test of all solar PV components: • • Continuity Test, • • Polarity check and other commissioning activities • and show how to verify polarity and check continuity of the system.	4	3	-	-
PC5. show how to measure and verify inverter operation including anti islanding performance and measurement of AC system values, DC voltage, current in each string, and array for system operation.	-	5	-	-
PC6. show how to verify workmanship and proficiency is using tools and equipment.	-	4	-	-
PC7. explain the concerned regulations & standards for grid interconnection and examine concerned regulations & standards for grid interconnection.	4	4	-	-
PC8. show how to initiate system startup procedures, measure and record voltage and other parameters, record anomaly and document changes.	-	4	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. describe the commissioning process for the solar PV system and demonstrate the commissioning process for the Solar PV System.	4	4	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	SGJ/N0105
NOS Name	Test and commission Solar PV system
Sector	Green Jobs
Sub-Sector	Renewable Energy
Occupation	Testing & Commissioning
NSQF Level	4
Credits	1
Version	4.0
Last Reviewed Date	30/05/2024
Next Review Date	29/05/2027
NSQC Clearance Date	30/05/2024

SGJ/N0622: Maintain Solar Photovoltaic Power System

Description

This unit is about how to perform preventive and troubleshoot activities to maintain solar photovoltaic power system

Scope

The scope covers the following :

- preventive maintenance of system
- inspection of the system
- troubleshoot of the component's functions
- completion of work
- follow greening principles at workplace

Elements and Performance Criteria

Maintain Solar Photovoltaic Power System

To be competent, the user/individual on the job must be able to:

PC1. explain how to carry out maintenance activities required for each component and demonstrate how to carry out maintenance work for each component.

PC2. discuss how to clean solar panels with water in low sunlight to remove dust, bird droppings, pollen, leaves, branches and snow for maximum energy output from the system and show how to clean solar panels with water in low sunlight to remove dust, bird droppings, pollen, leaves, branches and snow for maximum energy output from the system.

PC3. explain different methods which are employed for cleaning modules/array including mechanical or robotic cleaning and show how to wipe hard stains with sponge/cotton and use cleaning agents to wipe off stains from module framing.

PC4. explain how to prepare and execute preventive maintenance schedule and reactive maintenance activities and demonstrate how to prepare and execute preventive maintenance schedule and reactive maintenance activities.

PC5. show how to routinely inspect the system and check those for shading, loose connections, any external damages etc.

PC6. • discuss the role of AI & ML (Artificial Intelligence & Machine Learning) and IOT application for -
• • Predictive maintenance using AI algorithms
• • Pattern study
• • Fault detection and diagnosis
• • Performance optimization and energy forecasting

PC7. explain the typical faults, their causes and resolution for all components.

PC8. discuss how to check current output, identify faulty module and perform standard troubleshoot measure and show how to check output voltage and compare with expected output voltage.

PC9. demonstrate how to check that electrical connections as per specifications and mountings are stable.

PC10. explain how to identify faults and damages and how to escalate it to seniors and demonstrate how to identify typical faults, their causes and resolution for all components.

PC11. discuss how to collect monthly and yearly data from remote monitoring unit.

PC12. discuss how to perform and verify the CUF and PR of the solar plant.

PC13. show how to identify faults and perform standard troubleshooting.

PC14. discuss and show how to clean the work area after completing the maintenance activity.

PC15. show how to check working conditions of fuses, circuit breakers, cables, service panel connections, inverter etc and identify damage if any.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. company's installation policy

KU2. basic electrical system and functioning

KU3. usage and handling procedure of solar panels

KU4. basics on solar energy system and power generation

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. take decision with systematic course of actions and/or response

GS2. follow organisation rule- based decision making process

GS3. choose best methods to complete assigned tasks

GS4. plan and organize service work to meet deadlines

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Maintain Solar Photovoltaic Power System	**25**	**25**	**-**	**-**
PC1. explain how to carry out maintenance activities required for each component and demonstrate how to carry out maintenance work for each component.	2	2	-	-
PC2. discuss how to clean solar panels with water in low sunlight to remove dust, bird droppings, pollen, leaves, branches and snow for maximum energy output from the system and show how to clean solar panels with water in low sunlight to remove dust, bird droppings, pollen, leaves, branches and snow for maximum energy output from the system.	2	2	-	-
PC3. explain different methods which are employed for cleaning modules/array including mechanical or robotic cleaning and show how to wipe hard stains with sponge/cotton and use cleaning agents to wipe off stains from module framing.	2	2	-	-
PC4. explain how to prepare and execute preventive maintenance schedule and reactive maintenance activities and demonstrate how to prepare and execute preventive maintenance schedule and reactive maintenance activities.	2	2	-	-
PC5. show how to routinely inspect the system and check those for shading, loose connections, any external damages etc.	-	4	-	-
PC6. • discuss the role of AI & ML (Artificial Intelligence & Machine Learning) and IOT application for - • • Predictive maintenance using AI algorithms • • Pattern study • • Fault detection and diagnosis • • Performance optimization and energy forecasting	2	-	-	-
PC7. explain the typical faults, their causes and resolution for all components.	4	-	-	-
PC8. discuss how to check current output, identify faulty module and perform standard troubleshoot measure and show how to check output voltage and compare with expected output voltage.	2	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. demonstrate how to check that electrical connections as per specifications and mountings are stable.	-	2	-	-
PC10. explain how to identify faults and damages and how to escalate it to seniors and demonstrate how to identify typical faults, their causes and resolution for all components.	2	2	-	-
PC11. discuss how to collect monthly and yearly data from remote monitoring unit.	3	-	-	-
PC12. discuss how to perform and verify the CUF and PR of the solar plant.	2	-	-	-
PC13. show how to identify faults and perform standard troubleshooting.	-	4	-	-
PC14. discuss and show how to clean the work area after completing the maintenance activity.	2	-	-	-
PC15. show how to check working conditions of fuses, circuit breakers, cables, service panel connections, inverter etc and identify damage if any.	-	3	-	-
NOS Total	**25**	**25**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	SGJ/N0622
NOS Name	Maintain Solar Photovoltaic Power System
Sector	Green Jobs
Sub-Sector	Renewable Energy
Occupation	Operation and Maintenance, Solar Panel Installation Technician
NSQF Level	4
Credits	1
Version	2.0
Last Reviewed Date	30/05/2024
Next Review Date	30/05/2027
NSQC Clearance Date	30/05/2024

SGJ/N0106: Maintain Personal Health & Safety at project site

Description

This unit is about maintaining health, safety and hygiene at workplace.

Scope

The scope covers the following :

- Adopt safe practices at workplace
- Follow emergencies, rescue and first aid procedures
- Follow good housekeeping practices and infection control guidelines

Elements and Performance Criteria

Maintain Personal Health & Safety at project site

To be competent, the user/individual on the job must be able to:

PC1. explain the requirements for safe work area.

PC2. explain the importance of administering first aid and demonstrate how to administer first aid.

PC3. identify the personal protective equipment used for the specific purpose and demonstrate the usage of personal protective equipment for ensuring safety during installation and O&M work.

PC4. identify the hazards associated with photovoltaic installations and show how to follow recommended safe practices in handling physical, chemical, electrical and fire hazards and risk.

PC5. identify and report any hazards, risks or breaches in site safety to the appropriate authority.

PC6. identify work safety procedures and instructions for working at height and show how to handle all required tools, tackles, materials and equipment safely.

PC7. explain how to use safety signs, labels, charts and notices at workplace.

PC8. explain the importance of Occupational health & Safety standards and regulations for installation of Solar PV system.

PC9. show how to use appropriate fire extinguishers for different types of fire.

PC10. incorporate good housekeeping practices and infection control guidelines and demonstrate good housekeeping and infection control & prevention practices.

PC11. show how to administer first aid to a victim and use correct method to move injured person during an emergency.

PC12. show how to report immediately to concerned authorities regarding sign and symptoms of illness of self and other colleagues.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. importance of safety drills

KU2. importance of working in clean and safe environment
KU3. health and safety roles and responsibilities of relevant personnel within and outside the organization
KU4. reporting procedures in case of breaches or hazards for site safety, accidents and emergency situations
KU5. basic ergonomic principle
KU6. key internal and external source of health and safety information
KU7. meaning of hazards, risk and near miss
KU8. importance of Personal Protective Equipment required for specific job
KU9. forms and classification of hazardous substances
KU10. health effect associated with exposure to environmental pollution
KU11. housekeeping activities relevant to task
KU12. symptoms of infection like fever, cough, swelling and inflammation

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. record data on waste disposal at workplace
GS2. complete statutory documents relevant to safety and hygiene
GS3. fill safety formats for near miss, unsafe condition
GS4. identify potential safety risk and report to appropriate authority
GS5. communicate and collaborate with others to incorporate sustainable practices
GS6. interpret general safety guidelines, labels, charts and signage

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Maintain Personal Health & Safety at project site	**25**	**25**	**-**	**-**
PC1. explain the requirements for safe work area.	2	-	-	-
PC2. explain the importance of administering first aid and demonstrate how to administer first aid.	3	3	-	-
PC3. identify the personal protective equipment used for the specific purpose and demonstrate the usage of personal protective equipment for ensuring safety during installation and O&M work.	2	2	-	-
PC4. identify the hazards associated with photovoltaic installations and show how to follow recommended safe practices in handling physical, chemical, electrical and fire hazards and risk.	2	2	-	-
PC5. identify and report any hazards, risks or breaches in site safety to the appropriate authority.	2	-	-	-
PC6. identify work safety procedures and instructions for working at height and show how to handle all required tools, tackles, materials and equipment safely.	2	2	-	-
PC7. explain how to use safety signs, labels, charts and notices at workplace.	4	-	-	-
PC8. explain the importance of Occupational health & Safety standards and regulations for installation of Solar PV system.	4	-	-	-
PC9. show how to use appropriate fire extinguishers for different types of fire.	-	3	-	-
PC10. incorporate good housekeeping practices and infection control guidelines and demonstrate good housekeeping and infection control & prevention practices.	4	3	-	-
PC11. show how to administer first aid to a victim and use correct method to move injured person during an emergency.	-	5	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. show how to report immediately to concerned authorities regarding sign and symptoms of illness of self and other colleagues.	-	5	-	-
NOS Total	**25**	**25**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	SGJ/N0106
NOS Name	Maintain Personal Health & Safety at project site
Sector	Green Jobs
Sub-Sector	Renewable Energy
Occupation	PV System Installation Engineer
NSQF Level	5
Credits	1
Version	5.0
Last Reviewed Date	30/05/2024
Next Review Date	29/05/2027
NSQC Clearance Date	30/05/2024

SGJ/N0107: Customer orientation for Solar PV System

Description

This unit is about orientation of customer towards Solar PV System and handling over the completion documents.

Scope

The scope covers the following :

- Handover system completion documentation
- Demonstrate working procedure of Solar PV system

Elements and Performance Criteria

Completion and Handover Documentation

To be competent, the user/individual on the job must be able to:

PC1. explain how to prepare the checklist for handover of the solar power plant.

PC2. explain how to prepare complete and final documentation including commissioning forms and operation procedure and demonstrate the process of filling in checklist and completing handover documentation process.

PC3. explain how to record component serial numbers, file data sheet and complete equipment warranty registration.

PC4. discuss to inform the customer about the type of battery used, its life of operation and to dispose battery after its useful life to a recycling facility.

PC5. discuss how to deliver built drawings, permits, O&M documentation, project photos and customer operation manual.

PC6. discuss work safety procedures and instructions for handling heavy components and demonstrate work safety procedures and instructions for handling heavy components at project site.

PC7. describe start- up and shutdown procedure of a Solar PV system and demonstrate start- up and shutdown procedure of a solar PV system.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the keywords and its definitions used in industry

KU2. complete technical and commercial knowledge of the product

KU3. how to document information using appropriate corporate forms

KU4. definition of the jargons/terminologies used by the industry

KU5. units and symbols for irradiation and irradiance

KU6. ways to recognize common electrical problems

KU7. basic information about batteries used in PV systems and their appropriate disposal

KU8. common practices of conserving electricity
KU9. importance of effective communication in the at project site
KU10. importance of teamwork in organizational and individual success
KU11. gender, disability and cultural biases, stereotypes and impact on others
KU12. gender and its concepts such as gender roles, gender spectrum, gender as an identity
KU13. importance of gender sensitivity and equality
KU14. expressing and addressing grievances appropriately and effectively
KU15. how to help persons with disability to overcome the challenges

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. fill up documentation applicable to ones role
GS2. read English and/or vernacular language
GS3. read and understand manuals, health and safety instructions, memos, other company documents
GS4. read from different sources- books screens in machines and signage
GS5. read various color codes, as per standard electrical, mechanical and civil nomenclature
GS6. express statements or information clearly so that others can hear and understand
GS7. participate in and understand the main points of simple discussions
GS8. respond appropriately to any queries
GS9. communicate with supervisor
GS10. follow organization's rule-based decision making process
GS11. take decision with systematic course of actions and/or response
GS12. plan and organize work to meet deadlines
GS13. work constructively and collaboratively with others
GS14. follow code of conduct
GS15. manage relationships with customers with intent on satisfying its requirements for service delivery
GS16. recognize problems and search for solutions
GS17. choose best methods to complete assigned tasks
GS18. approach relevant authority when required
GS19. apply domain knowledge, observations and data to select course of action to perform tasks related to solar photovoltaic systems
GS20. evaluate critical information obtained from customers, supervisor and co-workers to perform day to day activities
GS21. ask questions for better understanding
GS22. communicate with colleagues on the significance of greening of jobs
GS23. relevant occupational health and safety standards and waste management procedures
GS24. evaluate information obtained from customers, supervisor and co-workers to perform day to day activities

GS25. communicate effectively with clients, supervisor, peers and subordinates

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Completion and Handover Documentation	**31**	**19**	**-**	**-**
PC1. explain how to prepare the checklist for handover of the solar power plant.	5	-	-	-
PC2. explain how to prepare complete and final documentation including commissioning forms and operation procedure and demonstrate the process of filling in checklist and completing handover documentation process.	5	5	-	-
PC3. explain how to record component serial numbers, file data sheet and complete equipment warranty registration.	5	-	-	-
PC4. discuss to inform the customer about the type of battery used, its life of operation and to dispose battery after its useful life to a recycling facility.	4	-	-	-
PC5. discuss how to deliver built drawings, permits, O&M documentation, project photos and customer operation manual.	4	-	-	-
PC6. discuss work safety procedures and instructions for handling heavy components and demonstrate work safety procedures and instructions for handling heavy components at project site.	4	7	-	-
PC7. describe start- up and shutdown procedure of a Solar PV system and demonstrate start- up and shutdown procedure of a solar PV system.	4	7	-	-
NOS Total	**31**	**19**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	SGJ/N0107
NOS Name	Customer orientation for Solar PV System
Sector	Green Jobs
Sub-Sector	Renewable Energy
Occupation	Liasoning , Installation, Operation and Maintenance
NSQF Level	4
Credits	1
Version	4.0
Last Reviewed Date	30/05/2024
Next Review Date	30/05/2027
NSQC Clearance Date	30/05/2024

DGT/VSQ/N0102: Employability Skills (60 Hours)

Description

This unit is about employability skills, Constitutional values, becoming a professional in the 21st Century, digital, financial, and legal literacy, diversity and Inclusion, English and communication skills, customer service, entrepreneurship, and apprenticeship, getting ready for jobs and career development.

Scope

The scope covers the following :

- Introduction to Employability Skills
- Constitutional values - Citizenship
- Becoming a Professional in the 21st Century
- Basic English Skills
- Career Development & Goal Setting
- Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy
- Essential Digital Skills
- Entrepreneurship
- Customer Service
- Getting ready for Apprenticeship & Jobs

Elements and Performance Criteria

Introduction to Employability Skills

To be competent, the user/individual on the job must be able to:

PC1. identify employability skills required for jobs in various industries

PC2. identify and explore learning and employability portals

Constitutional values – Citizenship

To be competent, the user/individual on the job must be able to:

PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.

PC4. follow environmentally sustainable practices

Becoming a Professional in the 21st Century

To be competent, the user/individual on the job must be able to:

PC5. recognize the significance of 21st Century Skills for employment

PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life

Basic English Skills

To be competent, the user/individual on the job must be able to:

PC7. use basic English for everyday conversation in different contexts, in person and over the telephone

PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English

PC9. write short messages, notes, letters, e-mails etc. in English

Career Development & Goal Setting

To be competent, the user/individual on the job must be able to:

PC10. understand the difference between job and career

PC11. prepare a career development plan with short- and long-term goals, based on aptitude

Communication Skills

To be competent, the user/individual on the job must be able to:

PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings

PC13. work collaboratively with others in a team

Diversity & Inclusion

To be competent, the user/individual on the job must be able to:

PC14. communicate and behave appropriately with all genders and PwD

PC15. escalate any issues related to sexual harassment at workplace according to POSH Act

Financial and Legal Literacy

To be competent, the user/individual on the job must be able to:

PC16. select financial institutions, products and services as per requirement

PC17. carry out offline and online financial transactions, safely and securely

PC18. identify common components of salary and compute income, expenses, taxes, investments etc

PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation

Essential Digital Skills

To be competent, the user/individual on the job must be able to:

PC20. operate digital devices and carry out basic internet operations securely and safely

PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively

PC22. use basic features of word processor, spreadsheets, and presentations

Entrepreneurship

To be competent, the user/individual on the job must be able to:

PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research

PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion

PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity

Customer Service

To be competent, the user/individual on the job must be able to:

PC26. identify different types of customers

PC27. identify and respond to customer requests and needs in a professional manner.

PC28. follow appropriate hygiene and grooming standards

Getting ready for apprenticeship & Jobs

To be competent, the user/individual on the job must be able to:

PC29. create a professional Curriculum vitae (Résumé)

PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively

PC31. apply to identified job openings using offline /online methods as per requirement

PC32. answer questions politely, with clarity and confidence, during recruitment and selection

PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. need for employability skills and different learning and employability related portals

KU2. various constitutional and personal values

KU3. different environmentally sustainable practices and their importance

KU4. Twenty first (21st) century skills and their importance

KU5. how to use English language for effective verbal (face to face and telephonic) and written communication in formal and informal set up

KU6. importance of career development and setting long- and short-term goals

KU7. about effective communication

KU8. POSH Act

KU9. Gender sensitivity and inclusivity

KU10. different types of financial institutes, products, and services

KU11. how to compute income and expenditure

KU12. importance of maintaining safety and security in offline and online financial transactions

KU13. different legal rights and laws

KU14. different types of digital devices and the procedure to operate them safely and securely

KU15. how to create and operate an e- mail account and use applications such as word processors, spreadsheets etc.

KU16. how to identify business opportunities

KU17. types and needs of customers

KU18. how to apply for a job and prepare for an interview

KU19. apprenticeship scheme and the process of registering on apprenticeship portal

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and write different types of documents/instructions/correspondence

GS2. communicate effectively using appropriate language in formal and informal settings

GS3. behave politely and appropriately with all
GS4. how to work in a virtual mode
GS5. perform calculations efficiently
GS6. solve problems effectively
GS7. pay attention to details
GS8. manage time efficiently
GS9. maintain hygiene and sanitization to avoid infection

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction to Employability Skills	**1**	**1**	**-**	**-**
PC1. identify employability skills required for jobs in various industries	-	-	-	-
PC2. identify and explore learning and employability portals	-	-	-	-
Constitutional values – Citizenship	**1**	**1**	**-**	**-**
PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.	-	-	-	-
PC4. follow environmentally sustainable practices	-	-	-	-
Becoming a Professional in the 21st Century	**2**	**4**	**-**	**-**
PC5. recognize the significance of 21st Century Skills for employment	-	-	-	-
PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-
Basic English Skills	**2**	**3**	**-**	**-**
PC7. use basic English for everyday conversation in different contexts, in person and over the telephone	-	-	-	-
PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
PC9. write short messages, notes, letters, e-mails etc. in English	-	-	-	-
Career Development & Goal Setting	**1**	**2**	**-**	**-**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. understand the difference between job and career	-	-	-	-
PC11. prepare a career development plan with short- and long-term goals, based on aptitude	-	-	-	-
Communication Skills	**2**	**2**	**-**	**-**
PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
PC13. work collaboratively with others in a team	-	-	-	-
Diversity & Inclusion	**1**	**2**	**-**	**-**
PC14. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC15. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
Financial and Legal Literacy	**2**	**3**	**-**	**-**
PC16. select financial institutions, products and services as per requirement	-	-	-	-
PC17. carry out offline and online financial transactions, safely and securely	-	-	-	-
PC18. identify common components of salary and compute income, expenses, taxes, investments etc	-	-	-	-
PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation	-	-	-	-
Essential Digital Skills	**3**	**4**	**-**	**-**
PC20. operate digital devices and carry out basic internet operations securely and safely	-	-	-	-
PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively	-	-	-	-
PC22. use basic features of word processor, spreadsheets, and presentations	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Entrepreneurship	**2**	**3**	**-**	**-**
PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research	-	-	-	-
PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-
Customer Service	**1**	**2**	**-**	**-**
PC26. identify different types of customers	-	-	-	-
PC27. identify and respond to customer requests and needs in a professional manner.	-	-	-	-
PC28. follow appropriate hygiene and grooming standards	-	-	-	-
Getting ready for apprenticeship & Jobs	**2**	**3**	**-**	**-**
PC29. create a professional Curriculum vitae (Résumé)	-	-	-	-
PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
PC31. apply to identified job openings using offline /online methods as per requirement	-	-	-	-
PC32. answer questions politely, with clarity and confidence, during recruitment and selection	-	-	-	-
PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0102
NOS Name	Employability Skills (60 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	08/05/2025
Next Review Date	30/04/2028
NSQC Clearance Date	08/05/2025

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification will be created by the Sector Skill Council/Awarding Body. Each Element/ Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC/AB will also lay down proportion of marks for Theory and Skills Practical for each Element/ PC.

2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC/AB.

3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.

4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).

5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.

6. To pass the assessment, every trainee should score the Recommended Pass % aggregate for the Qualification.

7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification.

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
SGJ/N0101.Site survey for installation of solar PV system	57	43	0	0	100	20
SGJ/N0102.Procure Solar PV system components	32	18	0	0	50	10
SGJ/N0103.Install civil and mechanical parts of Solar PV system	20	30	0	0	50	10
SGJ/N0104.Installation of electrical components of a solar PV system	25	25	0	0	50	10
SGJ/N0105.Test and commission Solar PV system	20	30	0	0	50	10
SGJ/N0622.Maintain Solar Photovoltaic Power System	25	25	0	0	50	10
SGJ/N0106.Maintain Personal Health & Safety at project site	25	25	0	0	50	10
SGJ/N0107.Customer orientation for Solar PV System	31	19	0	0	50	10
DGT/VSQ/N0102.Employability Skills (60 Hours)	20	30	-	-	50	10
Total	**255**	**245**	**-**	**-**	**500**	**100**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.