

Model Curriculum

Solar Pump Technician

SECTOR: AGRICULTURE & ALLIED

**SUB-SECTOR: FORESTRY, ENVIRONMENT & RENEWABLE
ENERGY MANAGEMENT**

OCCUPATION: RENEWABLE ENERGY MANAGEMENT

REF ID: AGR/Q6701, V1.0

NSQF LEVEL: 4



Skill India
शिक्षणं शक्ति - कृषि-समृद्धि



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**CURRICULUM COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL
STANDARDS**

is hereby issued by the

AGRICULTURE SKILL COUNCIL OF INDIA

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: **'Solar Pump Technician'** QP No. **'AGR/Q6701 NSQF Level 4'**

Date of Issuance: March 9th, 2015

Valid up to: March 9th, 2016

* Valid up to the next review date of the Qualification Pack


S. S. Arora
Authorised Signatory
(Agriculture Skill Council of India)

Solar Pump Technician

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Solar Pump Technician”, in the “Agriculture & Allied” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Solar Pump Technician		
Qualification Pack Name & Reference ID. ID	AGR/Q6701, v1.0		
Version No.	1.0	Version Update Date	
Pre-requisites to Training	No entry level barrier		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • Assess the site: Pre installation activities, site assessment, review of the location • Procure raw materials: Raw materials, tools and equipments, procurement of raw materials • Install Solar Pump and battery: Understand the customer requirement, installation of solar pump, defect free installation <p>Maintain and service the solar pump: Check & identify the problems, maintenance</p>		

This course encompasses 6 out of 6 National Occupational Standards (NOS) of “Solar Pump Technician” Qualification Pack issued by “Agriculture Skill Council of India”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	Introduction Theory Duration (hh:mm) 5:00 Practical Duration (hh:mm) 0:00 Corresponding NOS Code	<ul style="list-style-type: none"> Understand General Discipline in the class room (Do's & Don'ts) Understand Role of a Solar Pump Technician Understand the importance of solar pump in Agriculture Learn and Practice Basic skills of communication Learn and Practice Basic reading capabilities to enable reading of signs, notices and/or cautions at site. 	Laptop, white board, marker, projector
2	Assessment of site and raw material procurement Theory Duration (hh:mm) 15:00 Practical Duration (hh:mm) 25:00 Corresponding NOS Code AGR/N6701	<ul style="list-style-type: none"> Understand the customer requirement Assess the Site/location Identify the convenient place for solar pump installation Understand the required tools and equipments Procure the raw materials for installation Understand and check the quality of the raw materials being procured 	Laptop, white board, marker, projector,
3	Solar panel and battery installation Theory Duration (hh:mm) 15:00 Practical Duration (hh:mm) 30:00 Corresponding NOS Code AGR/ N6702	<ul style="list-style-type: none"> Install the Solar panel in the field Connect the battery to solar panel Check the function of the solar panel after installation Perform Defect Free installation Report and document the completion of work 	Laptop, white board, marker, projector, solar panel, battery
4	Plumbing system and pump installation Theory Duration (hh:mm) 15:00 Practical Duration (hh:mm)	<ul style="list-style-type: none"> Assemble pipe sections, tubes and fittings Perform cut, thread and join pipes Understand the procedure to make opening in the structure Understand the procedure for the connecting the battery to the pump Adjust the water discharge as per the requirement 	Laptop, white board, marker, projector, Pump, Pipes, tubes, fittings,

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	25:00 Corresponding NOS Code AGR/N6703		
5	Co-ordinate with farmers and co-workers Theory Duration (hh:mm) 5:00 Practical Duration (hh:mm) 10:00 Corresponding NOS Code AGR/N6704	<ul style="list-style-type: none"> Understand the problems that farmers are facing in the field Find out the solution to resolve the problem Communicate the required information to farmers and co-workers Train the farmers on minor maintenance ,cleaning of panels and seasonal tilting of the panels 	Laptop, white board, marker, projector,
6	Maintenance and servicing of solar pump Theory Duration (hh:mm) 10:00 Practical Duration (hh:mm) 20:00 Corresponding NOS Code AGR/N6705	<ul style="list-style-type: none"> Check and identify the problems Understand the method of cleaning and reconnecting of the system Check the system <ul style="list-style-type: none"> Insulation Plumbing system Voltage Water level Blockages Short circuits, etc Maintain regular log book Servicing the system 	Laptop, white board, marker, projector,
7	Ensure safety at workplace Theory Duration (hh:mm) 10:00 Practical Duration (hh:mm) 15:00 Corresponding NOS Code AGR/N9953	<ul style="list-style-type: none"> Maintain a clean & efficient workplace Render appropriate emergency procedures Practice General safety and first aid 	Laptop, white board, marker, projector, gloves, first aid kit
	Total Duration: Theory Duration	Unique Equipment Required: Laptop, white board, marker, projector, solar panel, battery, Pump, Pipes, tubes, fittings,	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	(hh:mm) 75:00 Practical Duration (hh:mm) 125:00	gloves, first aid kit	

Grand Total Course Duration: **200 Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by [Agriculture Skill Council of India](#))

Trainer Prerequisites for Job role: "Solar Pump Technician" mapped to Qualification Pack: "AGR/Q6701, v1.0"

Sr. No.	Area	Details
1	Description	Trainer is responsible for educating the trainees- installation of the solar PV module on a mount/pole, connect it to the battery/inverter and the pump and connect the pump to the water source and destination.
2	Personal Attributes	Trainer should be Subject Matter Expert. He/she should have good communication, leadership, observation and practical oriented skills
3	Minimum Educational Qualifications	ITI (Electrical, Mechanical)
4a	Domain Certification	Certified for Job Role: <u>"Solar Pump Technician"</u> mapped to QP: <u>"AGR/Q6701, v1.0"</u> . Minimum accepted score is 80%
4b	Platform Certification	Certified for the Job Role: "Trainer", mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted score is 70%
5	Experience	ITI with experience of 5 Years in relevant field

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Solar Pump Technician
Qualification Pack	AGR/Q6701, v1.0
Sector Skill Council	Agriculture

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% in aggregate
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessment Outcome	Assessment Criteria	Total Marks (600)	Out of	Marks Allocation	
				Theory	Practical
1. Assessment of site and raw material procurement	PC1. understand the individual work requirement and areas of operation	100	3	2	1
	PC2. interact with the supervisor in order to understand the installation targets for the day and/or week		3	1	2
	PC3. understand the location of installations and optimise the route plan		4	2	2
	PC4. plan the day's activities and the complete work plan for each installation		4	2	2
	PC5. coordinate with various departments and persons involved in installation operation such as design, logistics, material handling and stores		4	2	2
	PC6. minimise absenteeism and report to work on time		2	1	1
	PC7. perform a site survey and soil type to understand the type of mounting structure and foundation design		4	1	3
	PC8. understand whether the mounting will be having automatic or manual seasonal tilt.		3	2	1
	PC9. decide on the type of mounting to be made depending on the wind, open spaces and shades		3	1	2
	PC10. ensure that land is levelled for flat surface mounting		2	1	1
	PC11. decide the type of mounting accessories required for installation as per the site condition		2	1	1
	PC12. ensure maximum period of sunlight is captured in the area		3	2	1
	PC13. ensure that construction is strong to hold solar panel for 20-25 years, especially, on roof top		3	2	1
	PC14. ensure that the installation is near the water source		2	1	1
	PC15. ensure that the destination field/ reservoir is within the specified limits of the motor		2	1	1
	PC16. ensure that the site is suitable for an underground battery compartment		2	1	1
	PC17. inform the customer of any civil construction to be undertaken for installing the panels		3	2	1

PC18. understand the location and mounting preference of customers	3	1	2
PC19. interact with customers and understand the purpose of installation and suggest alternatives	2	1	1
PC20. match the voltage and power output of the type of solar power system designed with battery and losses with rating power requirement of the pump as per customers preference	3	2	1
PC21. inform customers about the approximate time required for installation and any requirements during installation	2	1	1
PC22. get concurrence from the customer on the package of materials to be procured for installation based on agreed design	2	1	1
PC23. arrange for and collect the solar panels, pump controller, pump and battery as per customer's requirement	3	1	2
PC24. ensure that the quantity of modules / panels match the voltage/power requirement of the system	3	1	2
PC25. arrange for mounting stands/poles as per design	3	2	1
PC26. arrange for tools and consumables required for erection of poles/mounting the solar panels, digging for battery compartment	3	1	2
PC27. decide on the workforce required and arrange for team	3	2	1
PC28. ensure that only company recommended quality materials are used unless specified by customer	3	1	2
PC29. ensure all the materials procured are QC passed	2	1	1
PC30. ensure that module is not damaged and the outer glass is not broken	2	1	1
PC31. understand the material handling requirement and follow the standard operating procedure while moving them	3	2	1
PC32. cover the glass module with an opaque material to ensure that there is no electricity generation before installation	3	2	1

	PC33. ensure standard module handling procedure such as two people should lift a module, module should not be carried on head, etc.		3	1	2
	PC34. ensure that modules are stored in a way that it is not damaged by falling or by any external disturbance		3	1	2
	PC35. ensure the battery is handled in a way that it is not tilted on either side to avoid leakage of acid		3	2	1
	PC36. ensure that the motor is always kept above the water level in case of non submersible pumps		2	1	1
	Total		100	50	50
2. Solar panel and battery Installation	PC1. understand the customer requirement on installation	100	3	2	1
	PC2. ensure that all parts are available during installation time		3	1	2
	PC3. ensure that all the tools are available during installation		3	1	2
	PC4. ensure to disconnect PV module from any electric sources such as batteries, inverters, etc., before working on the module		3	2	1
	PC5. check that the module is defect free before installing		3	2	1
	PC6. ensure to take specified measures such as fire resistance, corrosion resistance for the module during installation		2	1	1
	PC7. understand the type of mounting and other accessories required		4	2	2
	PC8. 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		3	1	2
	PC9. ensure that sunlight falls perpendicular to the PV module to absorb maximum energy		2	1	1
	PC10. ensure that panels are mounted in a place where there is no shade at any time of the year from buildings or trees		3	2	1
	PC11. ensure that mounting/ pole is strong to withstand wind, rain, etc.		2	1	1
	PC12. ensure that any special construction requirement for mounting is done by following acceptable quality standards, especially, in field installations		2	1	1

PC13. use approved tools for mounting	4	2	2
PC14. set the mounting fixture firmly at the desired location	3	1	2
PC15. remove packaging of the solar panel carefully	2	1	1
PC16. handle the panels carefully without damaging the material	2	1	1
PC17. cover the module with opaque material while installing to avoid any current generation	2	1	1
PC18. ensure that junction box is covered	2	1	1
PC19. do not disturb or disassemble any part of the module during installation	3	2	1
PC20. take necessary precautions for fire resistance of modules	2	1	1
PC21. use recommended material of solar cable and plugs for electrical connection	2	1	1
PC22. Install spare fuse to avoid any short circuits as per company policy	3	2	1
PC23. mount the module on the fixture with the mounting rails using bolts and nuts	2	1	1
PC24. ensure that the panels are mounted firmly	2	1	1
PC25. Place the battery inside the battery compartment without tilting	3	1	2
PC26. use the cables to connect multiple PV modules in combination to generate the desired voltage and current	2	1	1
PC27. choose type of connection, i.e., series or parallel, as per design	2	1	1
PC28. use recommended cable to generate maximum voltage	2	1	1
PC29. Check the maximum system voltage as per the installation and follow adjustment measures accordingly to match output requirement	3	1	2
PC30. ensure that the modules are grounded as specified	3	2	1
PC31. connect the system to battery and check the charging of battery	3	1	2
PC32. escalate any issues faced during the functioning of the system	3	1	2
PC33. clean the work area after completing the installation activity	3	2	1

	PC34. remove all the tools, consumables used from the installation area		2	1	1
	PC35. fill in the job completion form and get the signature of the customer		2	1	1
	PC36. inform customers about maintenance of solar panels and procedure for cleaning of solar panels		4	2	2
	PC37. follow company standards in documentation of installation activities performed		3	1	2
	PC38. Ensure that the voltage output is as desired, the charging of the battery is normal and battery output is constant		3	2	1
	Total		100	50	50
3. Plumbing system and pump installation	PC1. assemble pipe sections, tubing and fittings	100	15	8	7
	PC2. cut, thread and join pipes		10	5	5
	PC3. make openings in structures		15	9	6
	PC4. Connect the pump to the battery in case of DC pump or inverter in case of AC pump.		20	10	10
	PC5. Connect pipes to the pump from source and to the destination of supply		15	7	8
	PC6. Adjust the discharge of water as per requirement		15	6	9
	PC7. Understand different type of pumps like submersible, non submersible pumps		10	5	5
	Total		100	50	50
4. Coordinate with farmers and Co-workers	PC1. discuss politely with the farmers about their issues	100	10	5	5
	PC2. understand the issues that farmers may face		5	2	3
	PC3. resolve the issues of the farmers and provide proper solution/training to ensure issues do not reoccur		10	5	5
	PC4. get feedback from the farmers on customer satisfaction		10	5	5
	PC5. communicate any potential hazards at a particular location		10	5	5
	PC6. train the farmers on minor maintenance ,cleaning of panels and seasonal tilting of the panels		8	4	4
	PC7. interact with colleagues from different functions and understand the nature of their work		7	4	3

	PC8. receive materials from tool room or stores; deposit faulty modules and tools to stores		10	5	5
	PC9. share work according to competency and capability		10	5	5
	PC10. assist colleagues with resolving field problems and achieve smooth workflow		10	5	5
	PC11. follow the company policy during cross functional interaction		10	5	5
	Total		100	50	50
5. Maintenance and Servicing of Solar Pump	PC1. Inspecting the Installation visually and with the help of diagnostic tools	100	10	5	5
	PC2. Understand and act upon the results of the diagnostic tests		10	5	5
	PC3. Clean the components and check the electrical joints/ plumbing leakages		5	2	3
	PC4. Reconnect all the components as per original installation		8	4	4
	PC5. Check the system visually for any obvious reasons		8	4	4
	PC6. Check the insulations of wires for any short circuits		5	3	2
	PC7. Check the plumbing system for any blockages		8	4	4
	PC8. Check voltage being generated as per data sheet		8	4	4
	PC9. Check the water level and issues in the pumps		8	4	4
	PC10. Replace any faulty components		10	5	5
	PC11. Maintain a regular logbook of each installation		10	5	5
	PC12. Follow the service and maintenance plan as per schedule		10	5	5
			Total		100
6. Ensure safety at work place	PC1. comply with safety procedures followed in the company	100	5	2	3
	PC2. take adequate safety measures while handling hazardous materials or tools		5	2	3
	PC3. take necessary measures while handling electrical equipment		5	2	3
	PC4. escalate matters about hazardous materials or things found in the premises		5	3	2
	PC5. follow appropriate material handling procedures to avoid any damages and injuries		10	5	5

PC6. use safety materials such as gloves, goggles, masks, helmets, etc.			5	3	2
PC7. undertake adequate safety measures while on work to prevent accidents which can cause loss to self, others or the company			5	2	3
PC8. ensure zero accidents in work			5	3	2
PC9. avoid damage of components due to negligence in ESD procedures			10	5	5
PC10. Ensure no loss for company due to safety negligence			5	3	2
PC11. participate in regular safety drills for being prepared in the event of a fire or natural calamity			10	5	5
PC12. help others during the drill or calamity			10	5	5
PC13. administer basic first aid			10	5	5
PC14. participate in company organised games and fitness sessions such as yoga etc			5	2	3
PC15. develop good posture for working so that long term health problems do not arise			5	3	2
			100	50	50
	Total	600	600	300	300
	<u>Percentage Weightage:</u>			<u>50%</u>	<u>50%</u>
	<u>Minimum Pass% to qualify (aggregate):</u>			<u>60%</u>	