QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR GREEN JOBS

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What are Occupational Standards (OS)?

- OS describe what individuals need to do, know and understand in order to carry out a particular job role or function
- OS are performance standards that individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding

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Introduction

Qualifications Pack-Solar Thermal Engineer Industrial Process Heat

(Option: Solar Thermal Consultant Industrial Process Heat)

SECTOR: GREEN JOBS

SUB-SECTOR: RENEWABLE ENERGY

OCCUPATION: DESIGN, INSTALLATION AND MAINTENANCE

REFERENCE ID: SGJ/Q0603

ALIGNED TO: NCO-2015/ NIL

Brief Job Description: Solar thermal engineer industrial process heat identifies the requirement of heat at desired temperatures for different processes across the industry, identifies the solar thermal technologies capable of delivering heat at those temperatures with relative efficiencies and cost, surveys available open ground/ roof area for installation of solar thermal technologies, select the technology , gets system of appropriate capacity installed and integrate with the existing heat source and ensure regular maintenance of the system

Options:
Solar Thermal Consultant Industrial Process Heat: *This option is about developing entrepreneurship skills for starting and managing new business.*

Personal Attributes: This job requires the individual to oversee the installation and maintenance of solar thermal plants and ensure it is completed without any accidents. So diligence and hardworking are desired attributes for individuals performing this role. He must also demonstrate strong work ethics, an ability to communicate courteously with co-workers, sub-ordinates and superiors

Job Details

Qualifications Pack Code	**SGJ/Q0603**		
Job Role	**Solar Thermal Engineer Industrial Process Heat** [This job role is applicable in both national and international scenarios]		
Credits (NSQF)	**TBD**	**Version number**	**1.0**
Sector	**Green Jobs**	**Drafted on**	**01/09/2016**
Sub-sector	**Renewable Energy**	**Last reviewed on**	**22/05/2017**
Occupation	**Installation and Maintenance**	**Next review date**	**30/09/2019**
NSQC Clearance on	**NA**		

Job Role	**Solar Thermal Engineer Industrial process heat**
Role Description	Solar Thermal Engineer Industrial Process Heat specializes in utilization, installation and maintenance of Solar Thermal Technologies for supply of process heat in industry
NSQF level	5
Minimum Educational Qualifications **Maximum Educational Qualifications**	B.E. / B.Tech (Mechanical /Chemical/ Civil) Not Applicable
Prerequisite License or Training	N/A
Minimum Job Entry Age	21 years
Experience	NA
Applicable National Occupational Standards (NOS)	**Compulsory:** 1. SGJ/N0607: Design solar thermal technology solutions for industrial process heat applications 2. SGJ/N0608: Ensure installation, testing and commissioning of solar thermal systems 3. SGJ/N0606: Carry out maintenance of solar thermal systems 4. SGJ/N0601: Maintain personal health & safety at solar thermal project site 5. SGJ/N0120: Work effectively with others **Option:** Solar Thermal Consultant Industrial Process Heat: 6. SGJ/N0111: Entrepreneurship skills
Performance Criteria	As described in the relevant OS units

Definitions

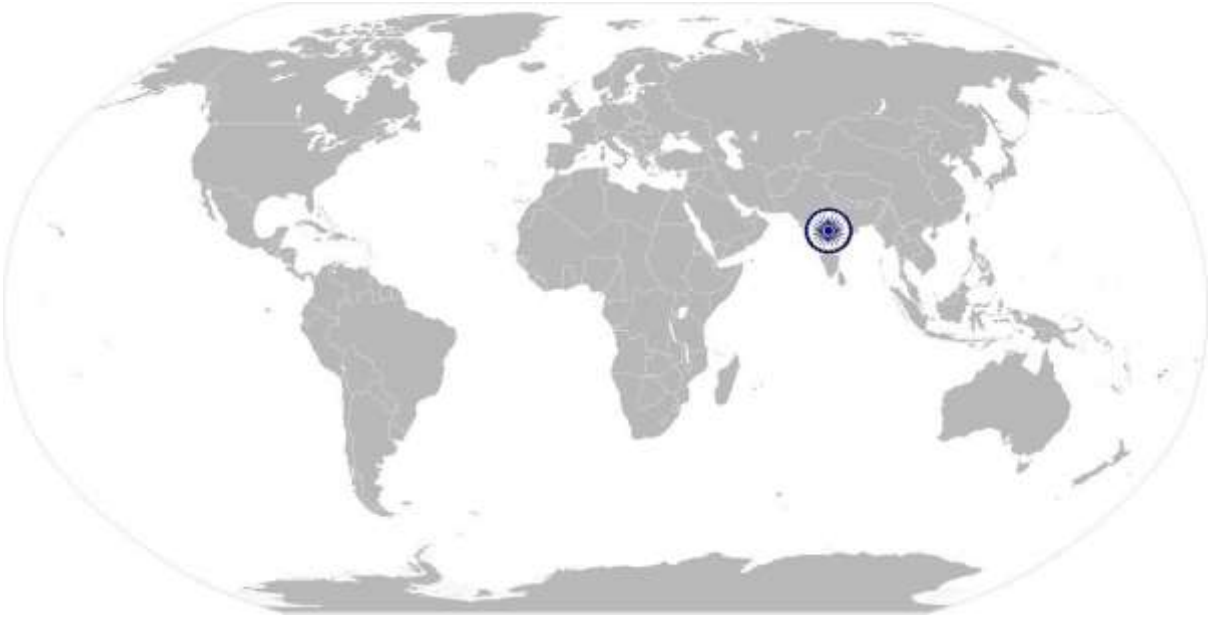
Keywords /Terms	Description
Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further 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 they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria	Performance criteria 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 OSs, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
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.
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	Knowledge and understanding are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual need 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	Core skills or generic skills 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. In the context of the OS, these include communication related skills that are applicable to most job roles.

Acronyms

Keywords /Terms	Description
SCGJ	Skill Council for green jobs
NOS	National Occupational Standards
NSQF	National Skills Qualification Framework
NVEQF	National Vocational Educational Qualification Framework
NVQF	National Vocational Qualification Framework
OS	Occupational Standards
PC	Performance Criteria
QP	Qualification Pack
SSC	Sector Skills Council
CSP	Concentrating Solar Power
CST	Concentrating Solar Thermal
PT	Parabolic Through
LFR	Linear Fresnel Reflector
IRDA	Indian Renewable Development Agency
OHS	Occupational Health and Safety

National Occupational Standard



Overview

This unit is about designing of solar thermal technology solutions for industrial process heat applications

SGJ/N0607 Design solar thermal technology solutions for industrial process heat applications

National Occupational Standard

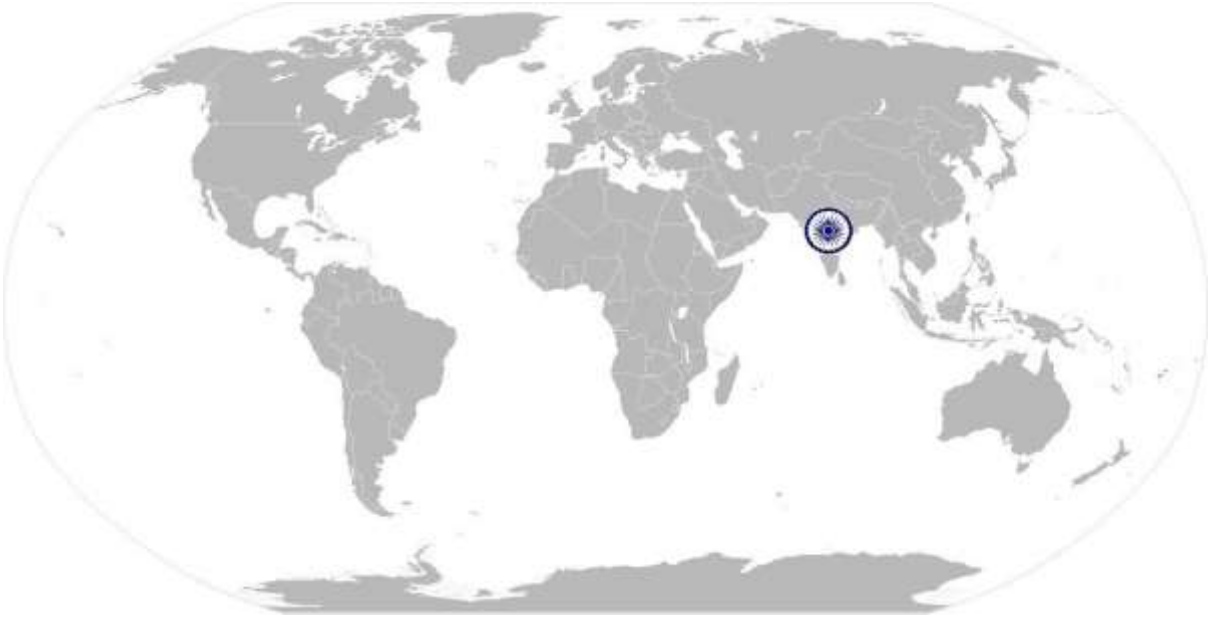
Unit Code	SGJ/N0607
Unit Title (Task)	**Design solar thermal technology solutions for industrial process heat applications**
Description	This unit is about designing of solar thermal technology solutions for industrial process heat applications
Scope	This unit/task covers the following: • analyze the client requirements • select and design solar thermal technology (ies) for supply of process heat
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Analyze the client requirements	To be competent, the user/ individual must be able to: PC1. visit the client site to understand the details of their manufacturing process PC2. identify the heat requirement for various process, temperature and quantity PC3. collect data on the present source of heat and its utilization PC4. compute the shadow free open area available on the ground or rooftop for installation of solar thermal system PC5. obtain and analyze solar radiation data for the project site PC6. describe the benefits of using solar thermal technologies to the client
Select and design solar thermal technology (ies) for supply of process heat	To be competent, the user/ individual must be able to : PC7. analyze and recommend the relevant solar thermal technologies(i.e. air collectors, FPC/ETC water heater, Scheffler disc, ARUN disc, parabolic trough collector, linear Fresnel reflector collector and solar cookers) as per client requirements and suitability PC8. suggest capacity of solar thermal system with estimated heat output at designed temperature and solar radiation levels PC9. design relevant solar thermal technology solution catering to the client's heating requirement
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the organization and its processes)	The user/individual on the job needs to know and understand: KA1. government/corporate policies and guidelines on: workplace safety, identification and mitigation of safety hazards, work procedures and guidelines for working at height KA2. document information using appropriate corporate forms KA3. obtain authorization from specified field safety officer and supervisor KA4. legislative, organization, site requirements and procedures
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. basics on concentrating solar thermal technology KB2. basic terminologies used for solar thermal technology like temperature, pressure, flow measurement KB3. efficiency, cost, typical specifications, functioning and operating principle of various equipment used for solar thermal technology including Air Collectors, FPC/ETC water heater, Scheffler disc, Arun disc, Parabolic Trough Collector, Linear Fresnel Reflector collector, solar cookers KB4. temperature ranges of various type of solar thermal technology KB5. the solar irradiation data for the project site KB6. various specifications of different solar thermal systems

SGJ/N0607 Design solar thermal technology solutions for industrial process heat applications

	KB7. knowledge of different types of manufactures of collectors KB8. relevant occupational health and safety standards KB9. precautions to be taken while handling different civil and mechanical products KB10. documentation standards and controls KB11. waste disposal procedures and standards KB12. various subsidies, excise duty exemptions and loans available for installation of various solar thermal systems
Skills (S)	
A. Core Skills/ Generic Skills	**Writing skills**
	The user/ individual on the job needs to know and understand how to: SA1. proper documentation as per relevant industry standards
	Reading skills
	The user/ individual on the job needs to know and understand: SA2. vernacular/English language SA3. how to read manuals, health and safety instructions, memos, other company documents SA4. how to read from different sources- books, screens in machines and signage SA5. the various colour codes, as per standard electrical, mechanical and civil nomenclature
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA6. express statements or information clearly so that others can hear and understand SA7. participate in and understand the main points of simple discussions SA8. respond appropriately to any queries SA9. communicate with peers, superiors and sub-ordinates
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1. follow organization rule-based decision making process SB2. take decision with systematic course of actions and/or response
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB3. plan and organize work to meet deadlines SB4. plan to utilize time and equipment effectively SB5. work constructively and collaboratively with others
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB6. follow organisation code of conduct SB7. manage relationships with customers with intent on satisfying its requirements for service delivery
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB8. recognize problems and provide solutions using a range of cognitive and practical skills SB9. approach relevant authority when required

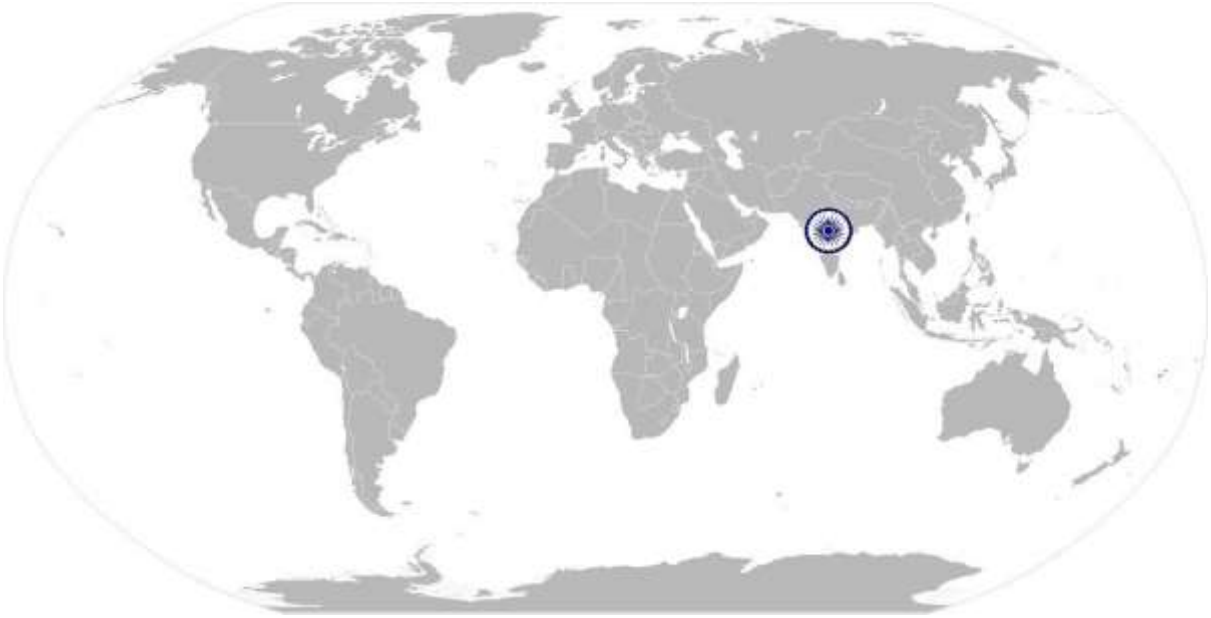
SGJ/N0607 Design solar thermal technology solutions for industrial process heat applications

	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB10. apply knowledge of facts, principles and processes to select the right course of action to perform tasks
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB11. use reasoning skills to identify and resolve basic problems SB12. use intuition to detect any potential problems which could arise during operations SB13. use acquired knowledge of the process for identifying and handling issues



NOS Version Control

NOS Code	SGJ/N0607		
Credits (NSQF)	TBD	Version number	1.0
Industry	Green Jobs	Drafted on	01/09/2016
Industry Sub-sector	Renewable Energy	Last reviewed on	15/02/2017
Occupation	Designing	Next review date	30/09/2019



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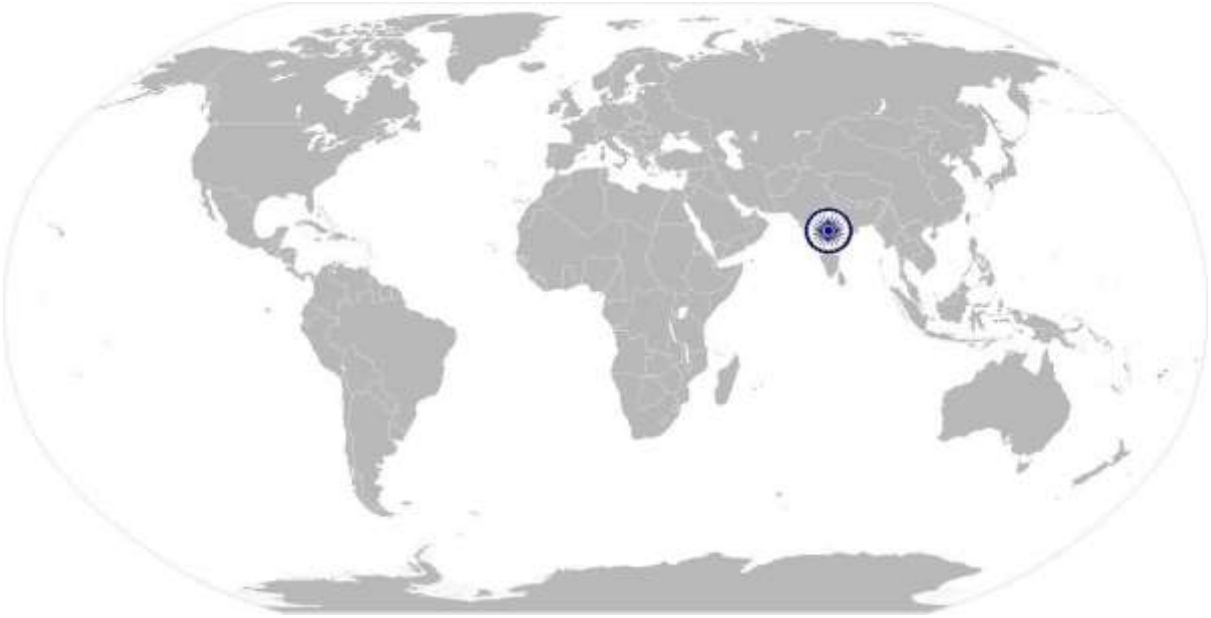


Overview

This unit is about ensuring installation, testing and commissioning of solar thermal systems

SGJ/N0608 Ensure installation, testing and commissioning of solar thermal systems

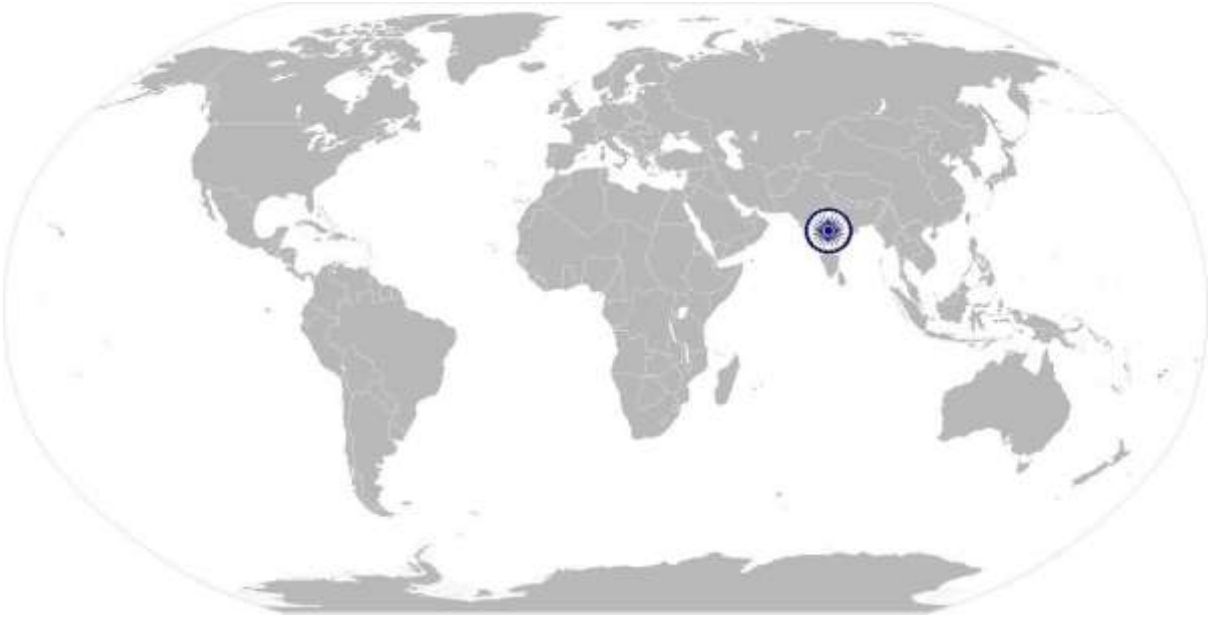
Unit Code	SGJ/N0608
Unit Title (Task)	**Ensure installation, testing and commissioning of solar thermal systems**
Description	This unit is about ensuring installation, testing and commissioning of solar thermal systems
Scope	This unit/task covers the following: • site preparation • installation as per design drawings • testing and commissioning
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Site preparation	To be competent, the user/ individual must be able to: PC1. analyze designs and drawings of solar thermal system PC2. ensure proper marking of site as per design and drawings
Installation as per design drawings	To be competent, the user/ individual must be able to : PC3. ensure installation of concentrating collectors and receiver mounting structures PC4. ensure installation and orientation of reflectors/ collector PC5. ensure installation of tracking system PC6. ensure installation of piping network including pumping system PC7. ensure installation of temperature sensors, vent and pressure release valves as per the design PC8. ensure the proper integration with auxiliary heating systems
Testing and Commissioning	To be competent, the user/ individual must be able to: PC9. ensure testing of pressure sensors, temperature sensors and vents/ pressure valves and replace accordingly if any defects found PC10. measure and compare pressure in different tubes as per design values PC11. carry out testing of the piping network for any leakages and rectify accordingly if any defects found PC12. ensure proper working of tracking system PC13. ensure the commission the solar thermal system PC14. monitor the operation of solar thermal system at start up PC15. prepare as- built drawing and document design changes, if any
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the organization and its processes)	The user/individual on the job needs to know and understand: KA1. government/corporate policies and guidelines on: workplace safety, identification and mitigation of safety hazards, work procedures and guidelines for working at height KA2. document information using appropriate corporate forms KA3. obtain authorization from specified field safety officer and supervisor KA4. legislative, organization, site requirements and procedures
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. basics on solar thermal technology KB2. basic terminologies used for solar thermal technology like temperature, pressure, flow measurement KB3. efficiency, cost, typical specifications, functioning and operating principle of various equipment used for solar thermal technology including Air Collectors, FPC/ETC water heater, Scheffler disc, Arun disc, Parabolic Trough Collector, Linear Fresnel Reflector collector, solar cooker KB4. temperature ranges of various type of solar thermal technologies

SGJ/N0608 Ensure installation, testing and commissioning of solar thermal systems

	KB5. the solar irradiation data for the project site KB6. installation and commissioning principles of solar thermal systems KB7. various specifications of solar thermal systems KB8. quality and process standards including Indian Boiler Regulations KB9. relevant occupational health and safety standards KB10. importance of wearing protective clothing and other safety gear while carrying out installation activities (PPEs) KB11. precautions to be taken while handling different civil and mechanical products KB12. documentation standards and controls KB13. waste disposal procedures and standards KB14. the various subsidies, excise duty exemptions and loans available for installation of solar thermal systems
Skills (S)	
A. Core Skills/ Generic Skills	**Writing skills**
	The user/ individual on the job needs to know and understand how to: SA1. prepare documentation as per relevant industry standards
	Reading skills
	The user/ individual on the job needs to know and understand: SA2. vernacular/English language SA3. how to read manuals, health and safety instructions, memos, other company documents SA4. how to read and interpret data from various sources SA5. the various colour codes, as per standard electrical, mechanical and civil nomenclature
	Oral Communication
	The user/individual on the job needs to know and understand how to: SA6. express statements or information clearly so that others can hear and understand SA7. participate in and understand the main points of simple discussions SA8. respond appropriately to any queries SA9. communicate with peers, superiors and sub-ordinates
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1. follow organization rule-based decision making process SB2. take decision with systematic course of actions and/or response
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB3. plan and organize work to meet deadlines SB4. plan to utilize time and equipment effectively SB5. work constructively and collaboratively with others
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB6. follow organisation code of conduct SB7. manage relationships with customers with intent on satisfying its requirements for service delivery
	Problem Solving
	The user/individual on the job needs to know and understand how to:

SGJ/N0608 **Ensure installation, testing and commissioning of solar thermal systems**

	SB8. recognize problems and provide solutions using a range of cognitive and practical skills SB9. approach relevant authority when required
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB10. apply knowledge of facts, principles and processes to select the right course of action to perform tasks
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB11. use reasoning skills to identify and resolve basic problems SB12. use intuition to detect any potential problems which could arise during operations SB13. use acquired knowledge of the process for identifying and handling issues



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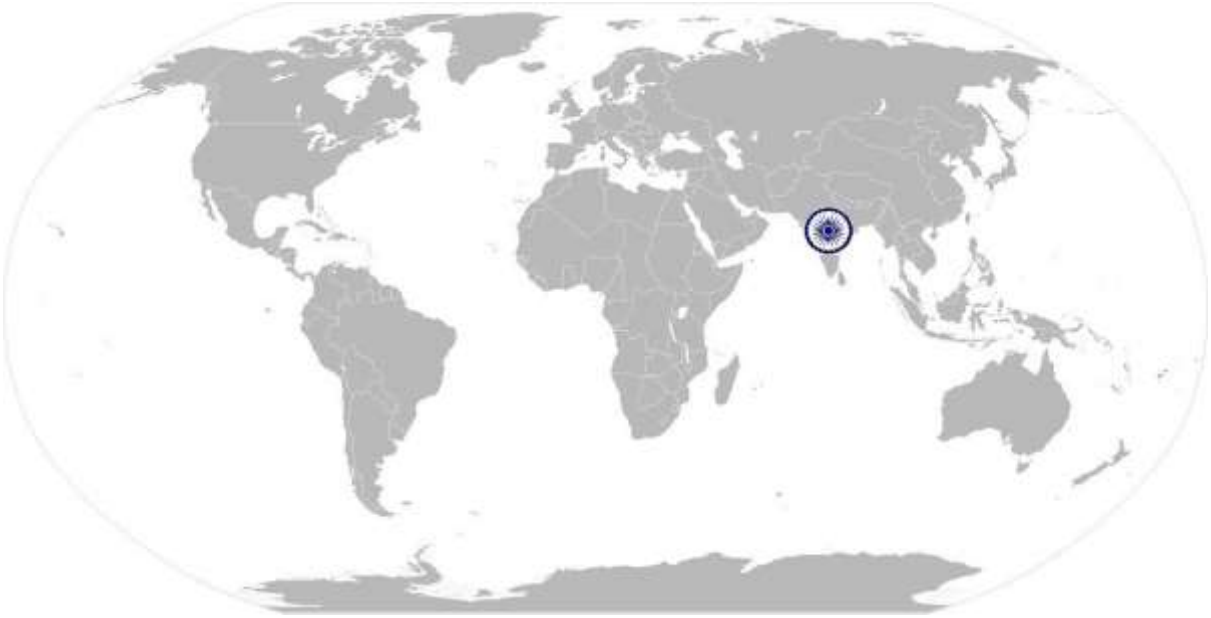
NOS Code	SGJ/N0608		
Credits (NSQF)	TBD	Version number	1.0
Industry	Green Jobs	Drafted on	01/09/2016
Industry Sub-sector	Renewable Energy	Last reviewed on	15/02/2017
Occupation	Installation and Commisioning	Next review date	30/09/2019



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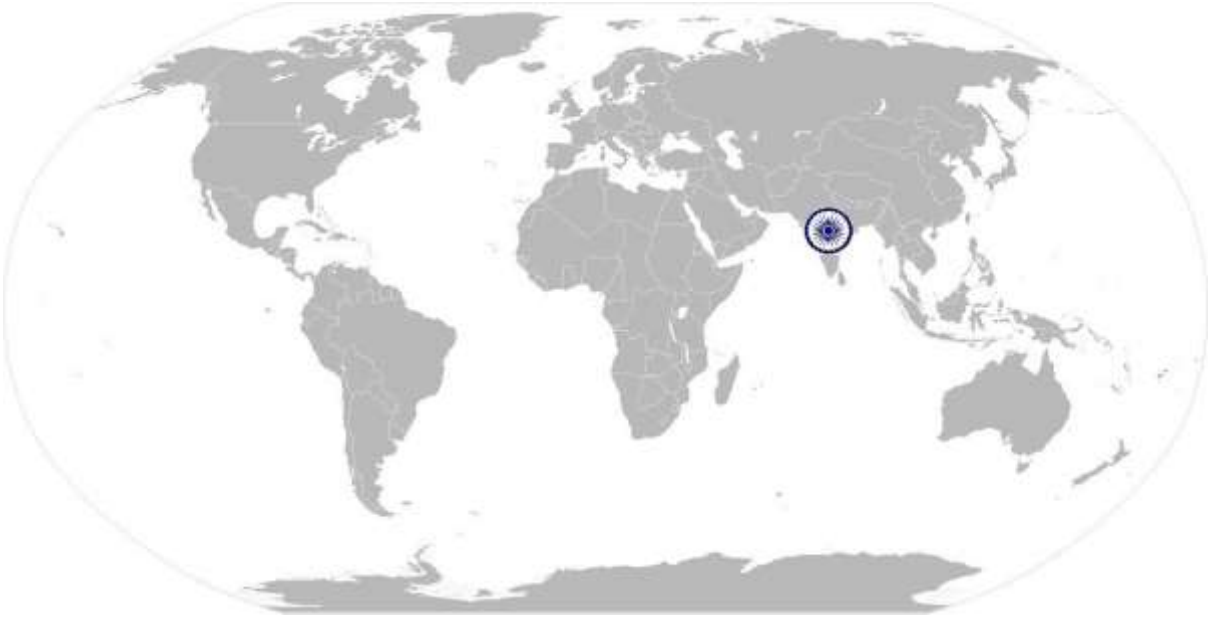


Overview

This unit is about maintenance of solar thermal systems

SGJ/N0606 Carry out maintenance of solar thermal systems

National Occupational Standard

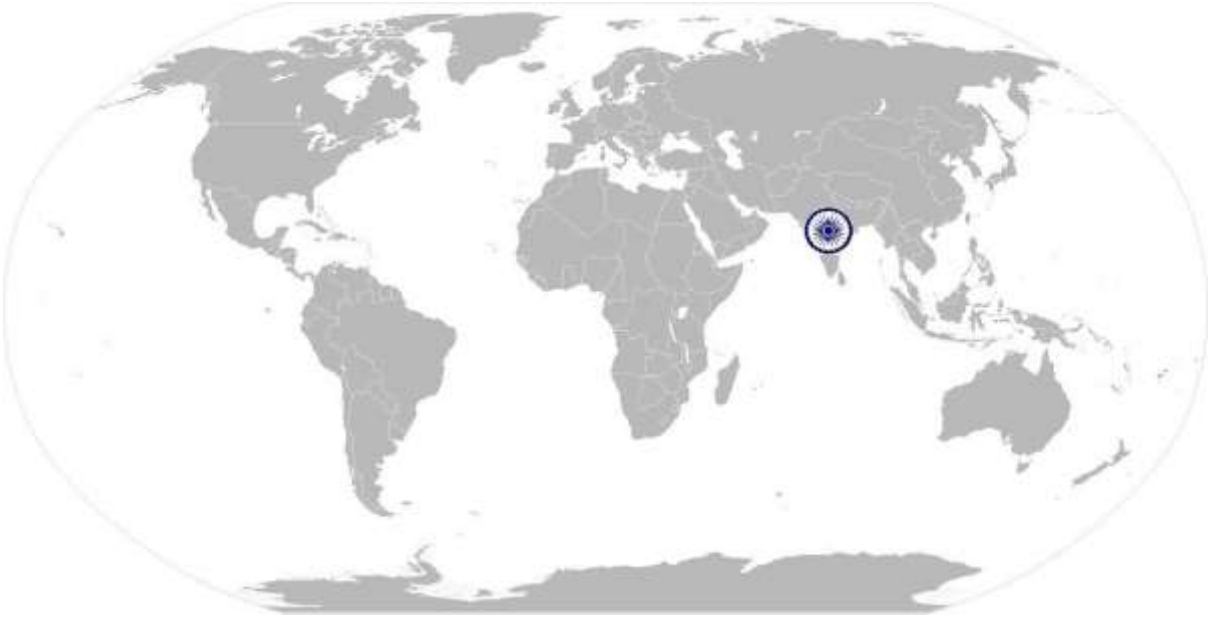
Unit Code	SGJ/N0606
Unit Title (Task)	**Carry out maintenance of solar thermal systems**
Description	This unit is about maintenance of solar thermal systems
Scope	This unit/task covers the following: • maintenance of reflectors/ collectors • maintenance of receivers and circulation system • maintenance of tracking system
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Maintenance of reflectors/collectors	To be competent, the user/ individual must be able to: PC1. ensure proper cleaning of reflectors/ collectors PC2. check the reflectors/collectors for any defects and report to superiors
Maintenance of receivers and circulation system	To be competent, the user/ individual must be able to: PC3. check the receivers for damage and report to the superiors PC4. check the receivers for black coating/ selective coating and in case of fading of paint, paint it with the black paint provided by the manufacturers for Scheffler and Arun and replace with new receiver tube in case of PT and FLR PC5. check the receiver pipes , receivers and heat delivery pipes for scale formation periodically and carry out de-scaling of pipes with descaling chemicals using descalar system PC6. clean and rinse the circulation pump as per relevant industry practices PC7. check for screwed connections of piping and containers and tighten if required PC8. check for leaks from circulation pipes and repair or replace the leak as well as the insulation on the pipe PC9. replace the resin and filters in the RO system periodically PC10. calibrate the temperature, pressure sensors and flow meters and other gauges, etc. as per design standards on a periodic basis
Maintenance of tracking system	To be competent, the user/ individual must be able to: PC11. check the sensors, tighten the connecting wires and replace the sensors, in case are found nonfunctional PC12. lubricate all moving parts of the tracking drive system periodically PC13. check the electrical connections of the drive motor PC14. undertake structural painting to improve life span of the system
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the organization and its processes)	The user/individual on the job needs to know and understand: KA1. government/corporate policies and guidelines on: workplace safety, identification and mitigation of safety hazards, work procedures and guidelines for working at height KA2. document information using appropriate corporate forms KA3. obtain authorization from specified field safety officer and supervisor KA4. legislative, organization, site requirements and procedures
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. usage and handling procedure of solar reflectors/collectors KB2. usage and handling of receivers and receiver tubes KB3. various types of applicable plumbing and welding jobs KB4. various sensors used in various solar thermal systems KB5. maintenance of driving system for tracking

SGJ/N0606 **Carry out maintenance of solar thermal systems**

	KB6. various types of cleaning procedures and consumables used KB7. various types of tools and procedures involved in maintenance and troubleshooting the system KB8. the prescribed parameters for different equipment and processes as per industrial norms KB9. various types of tools and equipment to be used in handling specific components KB10. relevant occupational health and safety standards and waste management procedures KB11. documentation standards and controls for maintenance activities KB12. standard operating procedures including Indian Boiler Regulations, etc.
Skills (S)	
A. Core Skills/ Generic Skills	**Writing Skills**
	The user/ individual on the job needs to know and understand: SA1. prepare documentation as per relevant industry standards
	Reading skills
	The user/ individual on the job needs to know and understand: SA2. vernacular/English language SA3. how to read manuals, health and safety instructions, memos, other company documents SA4. how to read from different sources- books, screens in machines and signage SA5. the various colour codes, as per standard electrical, mechanical and civil nomenclature
	Oral communication (listening and speaking skills)
	The user/ individual on the job needs to know and understand: SA6. express statements or information clearly so that others can hear and understand SA7. participate in and understand the main points of simple discussions SA8. communicate with peers, superiors and sub-ordinates
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1. follow organization rule-based decision making process SB2. take decision with systematic course of actions and/or response
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB3. plan and organize work to meet deadlines SB4. plan to utilize time and equipment effectively SB5. work constructively and collaboratively with others
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB6. follow organisation code of conduct SB7. manage relationships with customers with intent on satisfying its requirements for service delivery
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB8. recognize problems and search for solutions SB9. choose best methods to complete assigned tasks SB10. approach relevant authority when required

SGJ/N0606 **Carry out maintenance of solar thermal systems**

	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB11. apply domain knowledge, observations and data to select course of action to perform tasks related to solar thermal project site
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB12. use reasoning skills to identify and resolve basic problems SB13. use intuition to detect any potential problems which could arise during operations SB14. use acquired knowledge of the process for identifying and handling issues



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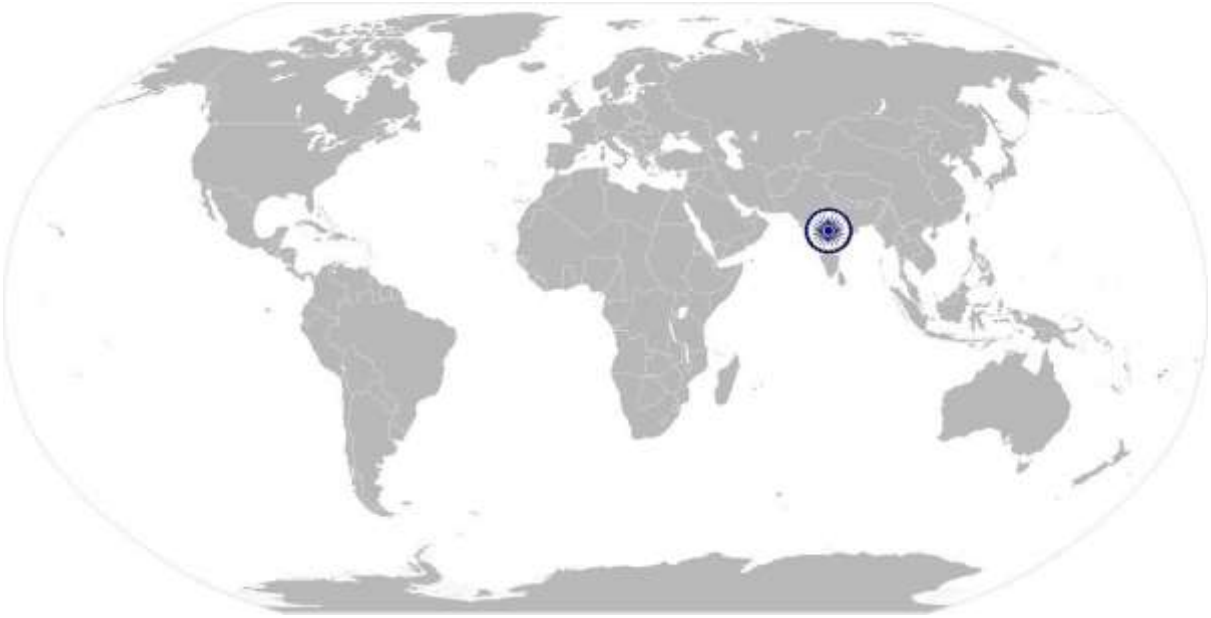
NOS Code	SGJ/N0606		
Credits (NSQF)	TBD	Version number	1.0
Industry	Green Jobs	Drafted on	01/09/2016
Industry Sub-sector	Renewable Energy	Last reviewed on	15/02/2017
Occupation	Maintenance	Next review date	30/09/2019



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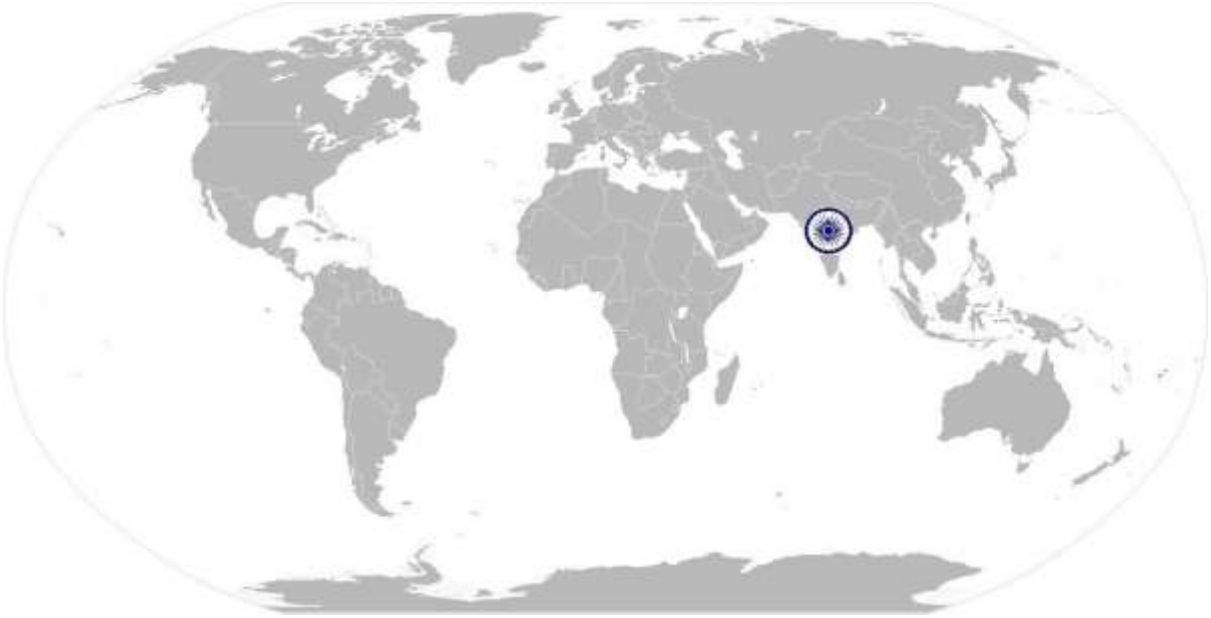
National Occupational Standard



Overview

This unit is about maintaining health & safety at solar thermal project site

SGJ/N0601 **Maintain personal health & safety in solar thermal project site**

National Occupational Standard

Unit Code	SGJ/N0601
Unit Title (Task)	**Maintain personal health & safety in solar thermal project site**
Description	This unit is about maintaining health & safety in solar thermal project site
Scope	This unit/task covers the following: • establish and follow safe work procedure • use and maintain personal protective equipment • identify and mitigate safety hazards • demonstrate safe and proper use of required tools and equipment • identify work safety procedures and instructions for working at height
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Establish and Follow safe work procedure	To be competent, the user/individual on the job must be able to: PC1. identify corporate policies required for workplace safety PC2. identify requirements for safe work area and create a safe work environment PC3. identify contact person when workplace safety policies are violated PC4. provide information about incident/violation PC5. identify the location of first aid materials and administer first aid
Use and maintain personal protective equipment	To be competent, the user/individual on the job must be able to: PC6. identify the personal protection equipment required for specific locations on-site PC7. identify expiry dates and wear & tear issues of specified equipment PC8. demonstrate safe and accepted practices for personal protection
Identify and mitigate safety hazards	To be competent, the user/individual on the job must be able to: PC9. identify environmental hazards associated with the project site PC10. identify heat and mechanical hazards PC11. identify personal safety hazards or work site hazards and mitigate hazards
Demonstrate safe and proper use of required tools and equipment	To be competent, the user/individual on the job must be able to: PC12. select tools, equipment and testing devices needed to carry out the work PC13. demonstrate safe and proper use of required tools and equipment
Identify work safety procedures and instructions for working at height	To be competent, the user/individual on the job must be able to: PC14. check access from ground to work area to ensure it is safe and in accordance with requirements PC15. re-assess risk control measures, as required, in accordance with changed work practices and/or site conditions and undertake alterations PC16. inspect/install fall protection and perimeter protection equipment ensuring adequacy for work and conformance to regulatory requirements PC17. identify approved methods of moving tools and equipment to work area and minimize potential hazards associated with tools at heights PC18. select and install appropriate signs and barricades PC19. place tools and materials to eliminate or minimize the risk of items being knocked down

SGJ/N0601 **Maintain personal health & safety in solar thermal project site**

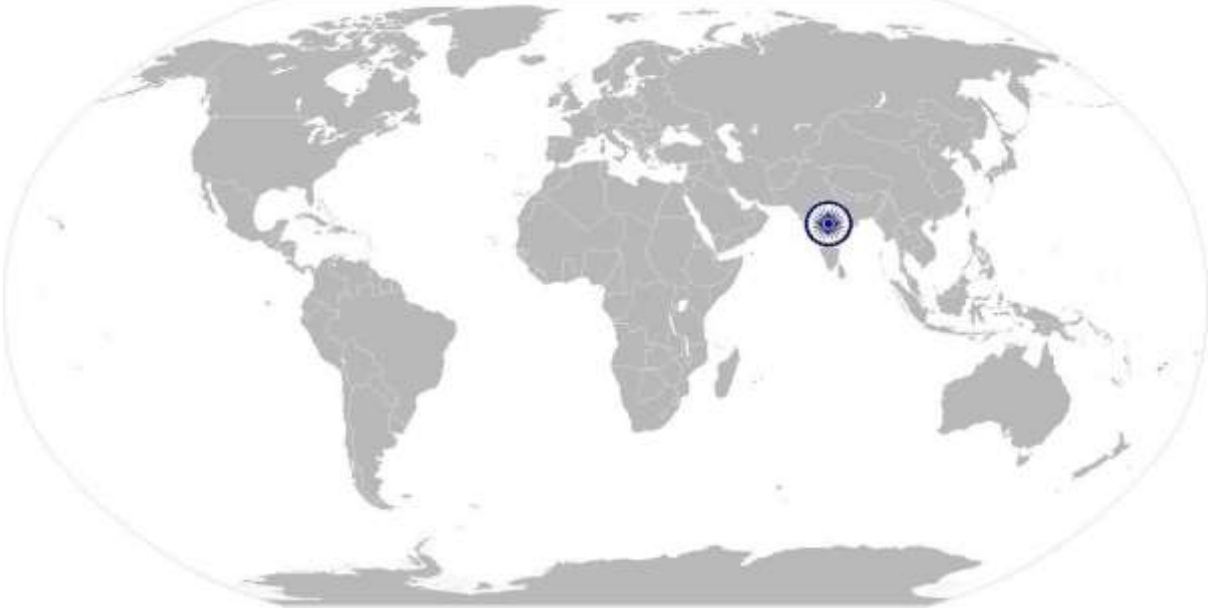
	PC20. dismantle plant safely in accordance with sequence and remove from worksite to clear work area
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the organization and its processes)	The user/individual on the job needs to know and understand: KA1. company's installation policy KA2. company's customer support policy KA3. company's documentation policy KA4. document information using appropriate corporate forms KA5. obtain authorization from specified field safety officer and supervisor KA6. company's reporting structure & organization culture KA7. company's different department and concerned authority
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. relevant personal protective equipment's required for solar thermal project site KB2. relevant standards and regulations for solar thermal project sites in India KB3. occupational health and safety (OHS) standards for solar thermal project sites KB4. risk identification and mitigation procedure for safe installation, operation and maintenance of solar thermal project sites KB5. knowhow of tools & tackles required to carry out the work
Skills (S)	
A. Core Skills/ Generic Skills	**Writing Skills**
	The user/ individual on the job needs to know and understand how to: SA1. fill up documentation applicable to one's role
	Reading Skills
	The user/individual on the job needs to know and understand: SA2. how to read vernacular/English language SA3. how to read and understand manuals, health and safety instructions, memos, other company documents SA4. how to read from different sources- books, screens in machines and signage SA5. the various colour codes, as per standard electrical, mechanical and civil nomenclature
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA6. express statements or information clearly so that others can hear and understand SA7. participate in and understand the main points of simple discussions SA8. respond appropriately to any queries SA9. communicate with peers, supervisor and sub-ordinates
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1. follow organization rule-based decision making process SB2. take decision with systematic course of actions and/or response
	Plan and Organize
	The user/individual on the job needs to know and understand: SB3. plan and organize service work to meet deadlines SB4. organize raw materials and packaging materials required for site survey SB5. plan to utilize time and equipment's effectively

SGJ/N0601 **Maintain personal health & safety in solar thermal project site**

	SB6. work constructively and collaboratively with others
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB7. follow code of conduct SB8. manage relationships with customers with intent on satisfying its requirements for service delivery
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB9. recognize problems and search for solutions SB10. choose best methods to complete assigned tasks SB11. approach relevant authority when required
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB12. apply domain knowledge, observations and data to select course of action to perform tasks related to solar thermal project sites
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB13. critically evaluate information obtained from customers, supervisor and co-workers to perform day to day activities SB14. ask questions for better understanding

NOS Version Control

NOS Code	SGJ/N0601		
Credits (NSQF)	TBD	Version number	1.0
Industry	Green Jobs	Drafted on	01/09/2016
Industry Sub-sector	Renewable Energy	Last reviewed on	15/02/2017
Occupation	Health and Safety	Next review date	30/09/2019



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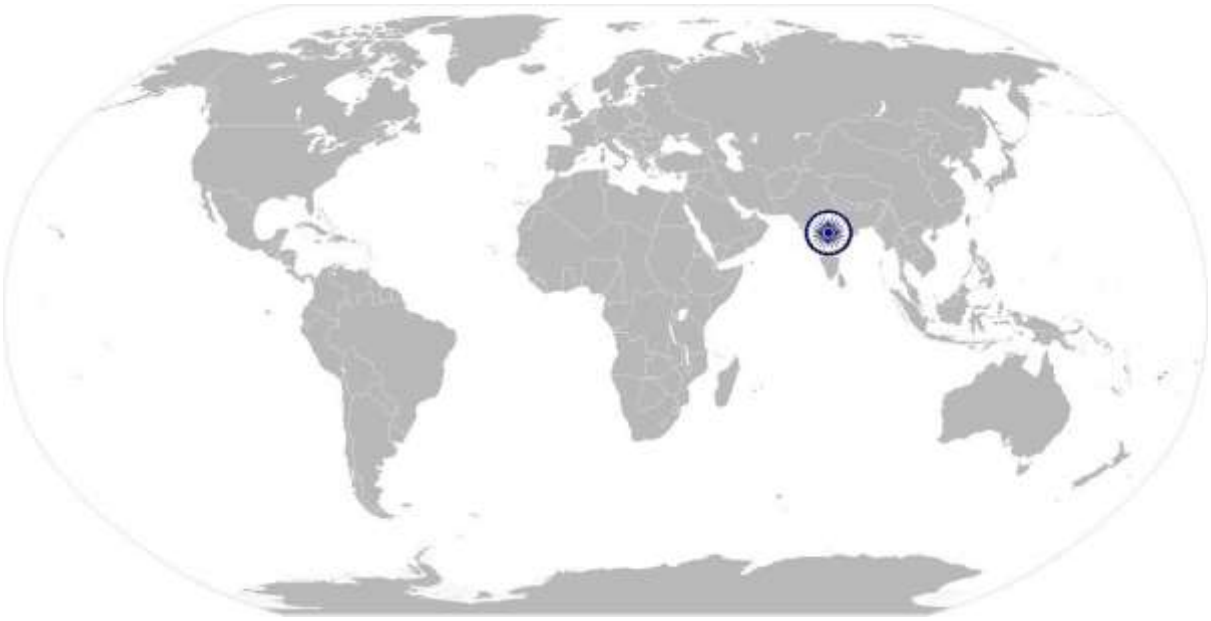
National Occupational Standard



Overview

This unit covers basic practices that improves the effectiveness of working with others in an organizational set-up

National Occupational Standard

SGJ/N0120 **Work effectively with others**

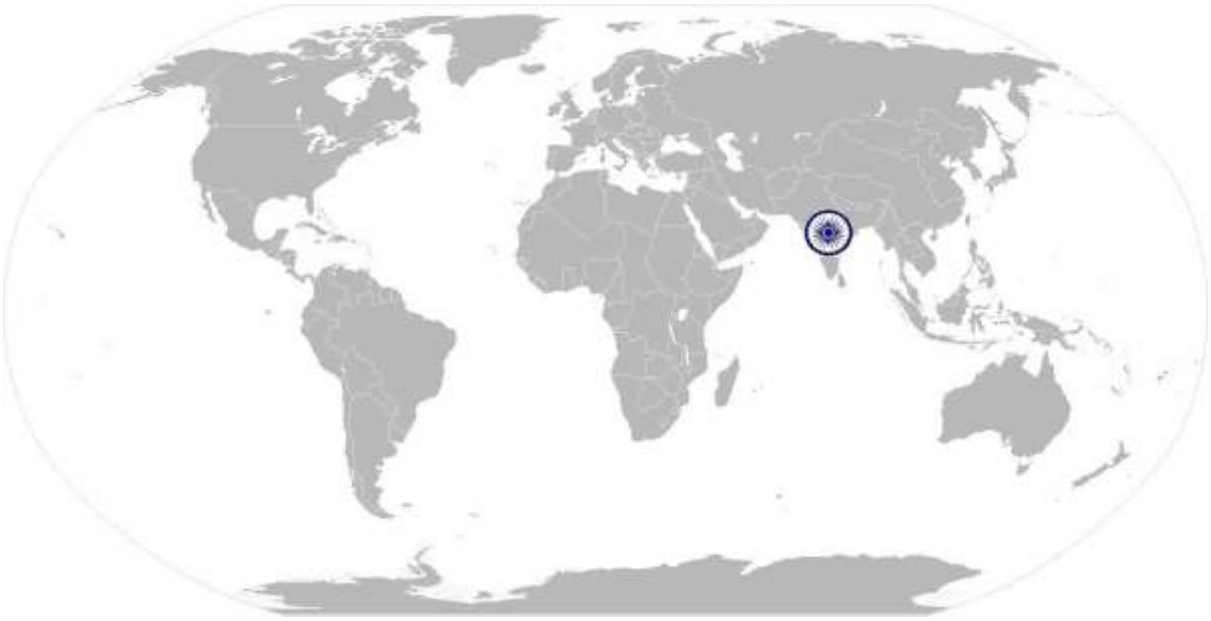
Unit Code	SGJ/N0120
Unit Title (Task)	**Work effectively with others**
Description	This unit covers basic etiquette and competencies that a candidate is required to possess and demonstrate in their behavior and interactions with others at the workplace
Scope	This unit/task covers the following: • working with others
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working with others	The user/individual on the job should be able to: PC1. accurately pass on information to the authorized persons who require it and within agreed timescale and confirm its receipt PC2. assist others in performing tasks in a positive manner where required and possible PC3. consult and assist others to maximize effectiveness and efficiency in carrying out tasks PC4. display appropriate communication etiquette while working PC5. display active listening skills while interacting with others at work PC6. demonstrate responsible and disciplined behaviors at the workplace PC7. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict PC8. identify the need for common grounds with clients, team members, etc. and negotiate in an effective manner to achieve the same PC9. consider and respect the opinions, creativity, values, beliefs and perspectives of others PC10. ensure collaboration and group participation to achieve common goals PC11. promote a friendly, co-operative environment that is conducive to employee's sense of belonging PC12. facilitate an understanding and appreciation of the differences among team members
Knowledge and Understanding (K)	
A. Organizational context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. legislation, standards, policies, and procedures followed in the organization relevant to own employment and performance conditions KA2. reporting structure, inter-dependent functions, lines and procedures in the work area KA3. relevant people and their responsibilities within the work area KA4. escalation matrix and procedures for reporting work and employment related issues
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. various categories of people that one is required to communicate and co-ordinate with in the organization KB2. importance of effective communication in the workplace KB3. importance of teamwork in organizational and individual success KB4. various components of effective communication

SGJ/N0120	Work effectively with others
	KB5. key elements of active listening KB6. value and importance of active listening and assertive communication KB7. barriers to effective communication KB8. importance of tone and pitch in effective communication KB9. importance of avoiding casual expletives and unpleasant terms while communicating professional circles KB10. how poor communication practices can disturb people, environment and cause problems for the employee, the employer and the customer KB11. key elements and importance of non-verbal communication KB12. importance of ethics for professional success KB13. importance of discipline for professional success KB14. what constitutes disciplined behavior for a working professional KB15. common reasons for interpersonal conflict KB16. importance of developing effective working relationships for professional success KB17. expressing and addressing grievances appropriately and effectively KB18. importance and ways of managing interpersonal conflict effectively KB19. importance of teamwork and collaboration
Skills (S)	
A. Core Skills/ Generic Skills	**Writing Skills**
	The user/ individual on the job needs to know and understand how to: SA1. note the information communicated SA2. record the readings of various parameters in the prescribed format SA3. note down observations related to the activity SA4. write information documents to internal departments/ internal teams
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA5. read vernacular/English language SA6. read and understand equipment manuals, health and safety instructions, memos, other company documents SA7. read from different sources- books, screens in machines and signage SA8. read internal information documents sent by internal teams
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA9. express statements or information clearly so that others can hear and understand SA10. participate in and understand the main points of simple discussions SA11. respond appropriately to any queries SA12. communicate effectively with supervisor, peers and subordinates
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1. follow organization rule-based decision making process SB2. analyze critical points in day to day tasks and identify control measures to solve the issue SB3. handle issues in case the superior is not available (as per the authority matrix defined by the organisation)
	Plan and Organize
	The user/individual on the job needs to know and understand how to : SB4. planning and organization of work to meet deadlines

SGJ/N0120	Work effectively with others
	SB5. work constructively and collaboratively with others SB6. support the superiors in scheduling tasks
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB7. follow organisation code of conduct SB8. manage relationships with customers with intent on satisfying its requirements for service delivery
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB9. recognize problems and search for solutions SB10. choose best methods to complete assigned tasks SB11. approach relevant authority when required
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB12. apply domain knowledge, observations and data to select course of action to perform tasks
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB13. critically evaluate information obtained from customers, supervisor and co-workers to perform day to day activities SB14. ask questions for better understanding

NOS Version Control

NOS Code	SGJ/N0120		
Credits (NSQF)	TBD	Version number	1.0
Industry	Green Jobs	Drafted on	01/09/2016
Industry Sub-sector	Renewable Energy	Last reviewed on	15/02/2017
Occupation	Team management	Next review date	30/09/2019



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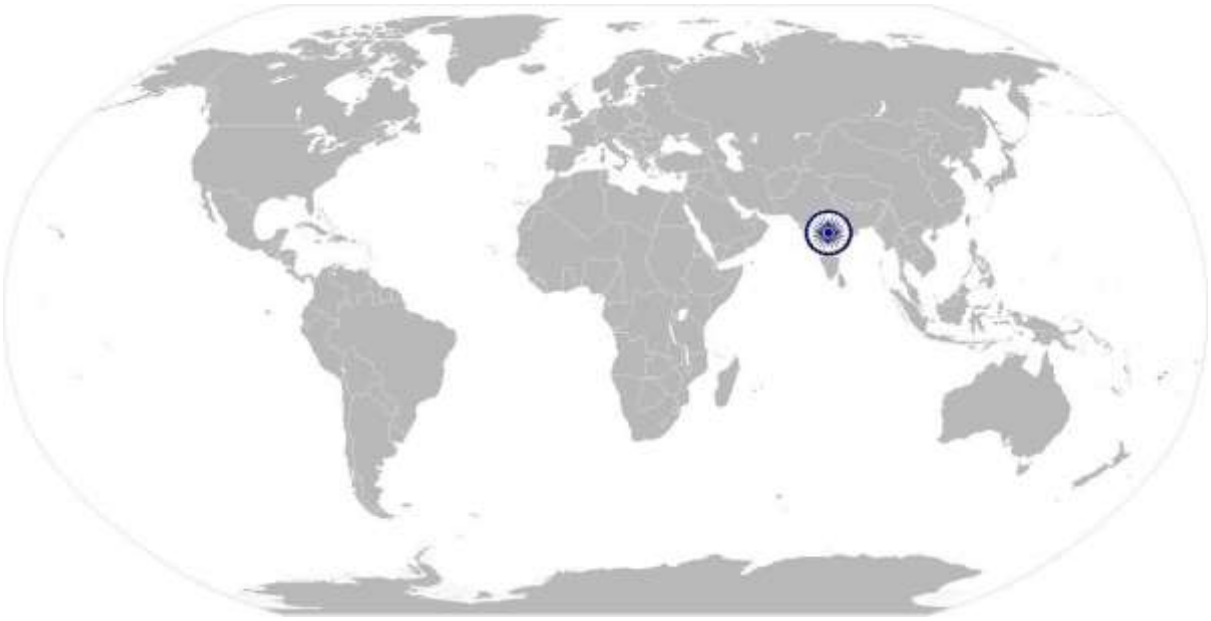
National Occupational Standard



Overview

This unit is about developing entrepreneurship skills for starting a new business and managing it

National Occupational Standard

Unit Code	SGJ/N0111
Unit Title(Task)	**Develop Entrepreneurship Skills**
Description	This unit is about developing entrepreneurship skills for starting a new business and managing it
Scope	This unit/ task covers the following: • starting a new venture • maintaining a business
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Starting a new venture	To be competent, the user/individual on the job must be able to: PC1. describe the process for setting up a new venture PC2. identify the key ingredients of a business plan PC3. distinguish between fixed and working capital requirements PC4. describe the components of a loan application for fund raising PC5. demonstrate good etiquettes and manners while communicating with the client PC6. demonstrate the importance of time management PC7. demonstrate leadership skills and effective resource management techniques
Maintaining a business	To be competent, the user/individual on the job must be able to: PC8. demonstrate the use of MS word and MS excel for preparing a proposal PC9. prepare a workable presentation for marketing and business development PC10. choose the right buyer in a given situation of market parameters PC11. identify the challenges and risks for new entrepreneurs and the possible mitigation measures
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company/ organization and its processes)	The user/individual on the job needs to know and understand: KA1. government/Corporate policies and guidelines on solar PV, Solar rooftop KA2. company's work safety policy KA3. company's customer support policy KA4. company's documentation policy KA5. obtain authorization from specified field safety officer and supervisor KA6. company's different department
B. Technical Knowledge	The individual on the job needs to know and understand the following aspects: KB1. definition of entrepreneurship from different perspectives KB2. outline the importance of entrepreneurship: Enhances creativity and innovation, builds self confidence in people, serves as a tool for nation building, serves as the engine of growth for the nation's economy KB3. state the characteristics of an entrepreneur: Characteristics of the entrepreneurs, Risk taking, Innovation and creativity, Opportunity Orientation KB4. explain the challenges/problems facing small businesses like Financing and Access to markets, government policies and inadequate managerial skills KB5. describe the procedure for registering a business by defining a Business Idea, source of business idea, Programs/ procedure and available schemes as well as components of a loan application KB6. state the process of starting a New Enterprises Process by mobilizing and reorganizing resources

SGJ/N0111 **Entrepreneurship skills**

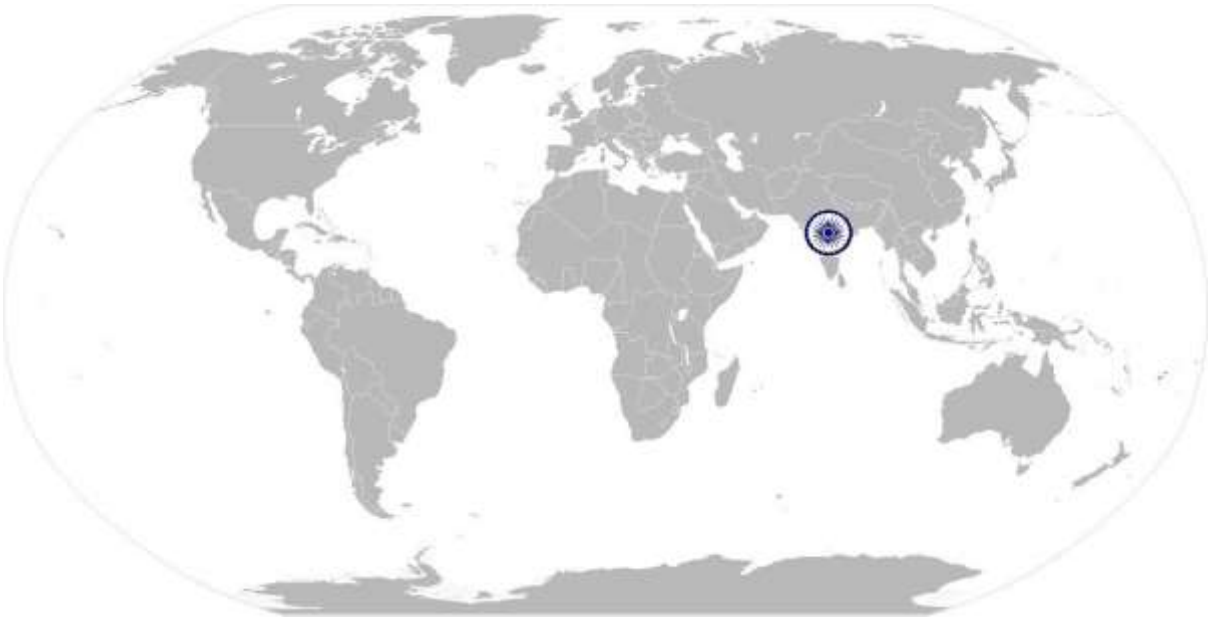
	KB7. study of different pictorial expression of non-verbal communication and its analysis KB8. components of Effective Communication- Conviction, confidence & enthusiasm, Listening KB9. KISS (keep it short & simple) in communication – composing effective messages KB10. identifying one's strength and weakness KB11. time management concepts including discipline, punctuality, act in time on commitment and quality productive time KB12. ability to shape and direct working/process methods according to self-defined criteria and effective management techniques KB13. understand leadership skills and Empathize to comprehend other opinions, points of views, and face them with understanding KB14. learn MS Word and MS excel: Creating, Organizing & Formatting Content, Collaborating – Merge, Insert, View, Edit, Track Mode etc. KB15. understand the fixed and capital working requirements for running a business KB16. understand how to make a business plan KB17. understand different taxation policies and their renewal process
Skills	
A. Core Skills/ Generic Skills	**Writing Skills**
	The user/ individual on the job needs to know and understand how to: SA1. prepare and maintain documentation
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA2. read vernacular/English language SA3. read and understand manuals, health and safety instructions, memos, other company documents SA4. read from different sources- books, screens in machines and signage SA5. read various colour codes, as per standard electrical, mechanical and civil nomenclature
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA6. express statements or information clearly so that others can hear and understand SA7. participate in and understand the main points of simple discussions SA8. respond appropriately to any queries SA9. communicate with employees
B. Professional Skills	**Decision making**
	The user/individual on the job needs to know and understand how to: SB1. define organization rule- based decision making process SB2. take decision with systematic course of actions and/or response
	Plan and organize
	The user/individual on the job needs to know and understand how to: SB3. plan and organize work schedule to meet deadlines SB4. work constructively and collaboratively with others

SGJ/N0111 **Entrepreneurship skills**

	Customer centricity
	The user/individual on the job needs to know and understand how to: SB5. prepare organization code of conduct SB6. manage relationships with customers with intent on satisfying its requirements for service delivery
	Problem solving
	SB7. recognize problems and search for solutions SB8. choose best methods to complete assigned tasks
	Analytical thinking
	The user/individual on the job needs to know and understand how to: SB9. apply domain knowledge, observations and data to select course of action to perform tasks related to solar photovoltaics
	Critical thinking
	The user/individual on the job needs to know and understand how to: SB10. critically evaluate information obtained from customers and workers to perform day to day activities SB11. ask questions for better understanding

NOS Version Control

NOS Code	SGJ/N0111		
Credits (NSQF)	TBD	Version number	1.0
Industry	Green Jobs	Drafted on	15/04/2016
Industry Sub-sector	Renewable Energy	Last reviewed on	02/05/2016
Occupation	Entrepreneur	Next review date	01/05/2019



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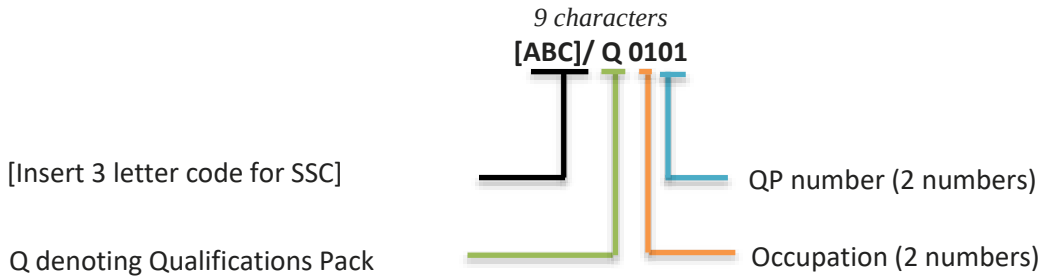
Annexure

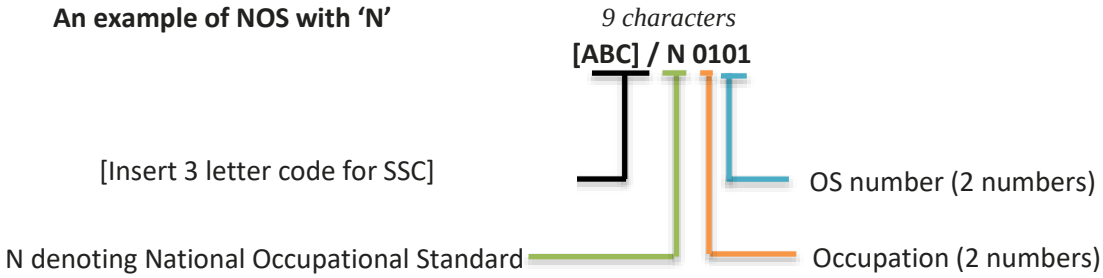
Nomenclature for QP and NOS

Qualifications Pack



Occupational Standard

An example of NOS with 'N'



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SGJ/Q0603 Qualifications Pack for "Solar Thermal Engineer Industrial Process Heat"

The following acronyms/codes have been used in the nomenclature above:

Sub-sector		Range of Occupation numbers
Renewable Energy (01-35)	**Solar Photovoltaic**	01-05
	Solar Thermal	06-10
	Wind	11-15
	Hydro	16-20
	Biomass	21-25
	Geothermal	26-30
	All Renewables (Cross-cutting/ Enabling Activities)	31-35
Green Transportation (36 - 40)	**Alternative Fuel Transportation**	36-40
	Bio-fuels and Farming	40-45
	Other Green Transportation	46-50
Green Construction (51- 60)	**Green Buildings**	51-55
	Energy Efficiency	56-60
Waste Management (61- 65)	**Waste Management**	61-65
Water Management (66-70)	**Water and Wastewater Management**	66-70
Co-Generation (71 - 75)	**Co-generation**	71-75
Other Green Jobs (76- 99)	**Carbon Sinks**	76-80
	Environmental Compliance and Sustainability Planning	81-85
	Other Green Jobs	85-99

Sequence	Description	Example
Three letters	Industry name	SGJ
Slash	/	/
Next letter	Whether QP or NOS	Q or N
Next two numbers	Occupation code	01
Next two numbers	OS number	01

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CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role Solar Thermal Engineer Industrial Process Heat

Qualification Pack SGJ/Q0603

Sector Skill Council Green Jobs

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. 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 this criterion.
6. To pass the Qualification Pack , every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.
7. In case of *unsuccessful completion*, the trainee may seek reassessment on the Qualification Pack.

Compulsory NOS **Total Marks: 400**			**Marks allocation**		
Assessment Outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out of**	**Theory**	**Skills Practical**
SGJ/N0607 Design solar thermal technology solutions for industrial process heat application	PC1. visit the client site to understand the details of their manufacturing process	**100**	3	2	1
	PC2. identify the heat requirement for various process, temperature and quantity		8	3	5
	PC3. collect data on the present source of heat and its utilization		10	7	3
	PC4. compute the shadow free open area available on the ground or rooftop for installation of solar thermal system		15	9	6
	PC5. obtain and analyse solar radiation data for the project site		15	9	6
	PC6. describe the benefits of using solar thermal technologies to the client		4	2	2
	PC7. analyse and recommend the relevant solar thermal technologies(i.e. air collectors, FPC/ETC water heater, Scheffler disc, ARUN disc, parabolic trough collector and linear Fresnel reflector collector) as per client requirements and suitability		15	10	5

	PC8. suggest capacity of solar thermal system with estimated heat output at designed temperature and solar radiation levels		15	10	5
	PC9. design relevant solar thermal technology solution catering to the client's requirement		15	6	9
		TOTAL	**100**	**58**	**42**
SGJ/N0608 Ensure installation, testing and commissioning of solar thermal systems	PC1. analyse designs and drawings of solar thermal system	**100**	5	3	2
	PC2. ensure proper marking of site as per design and drawings		8	4	4
	PC3. ensure the installation of concentrating collectors and receiver mounting structures		5	2	3
	PC4. ensure the proper installation and orientation of reflectors/collectors		5	2	3
	PC5. ensure the proper installation of tracking system		5	2	3
	PC6. ensure the proper installation of piping network including pumping system		10	4	6
	PC7. ensure the proper installation of temperature sensors, vent and pressure release valves as per design		5	2	3
	PC8. ensure the proper integration with auxiliary heating systems		10	4	6
	PC9. ensure the testing of pressure sensors, temperature sensors and vents/ pressure valves and replace accordingly if any defects found		10	4	6
	PC10. measure and compare pressure in different tubes as per design values		5	3	2
	PC11. ensure testing of piping network for any leakages and rectify accordingly		5	2	3
	PC12. ensure the proper working of tracking system		5	2	3
	PC13. ensure the commissioning of the solar thermal system		10	4	6
	PC14. monitor the operation of solar thermal system at start up		10	5	5
	PC15. prepare as built drawings and document design changes, if any		**2**	**0**	**2**
		TOTAL	**100**	**43**	**57**
SGJ/N0606 Carry out maintenance of solar thermal systems	PC1. ensure proper cleaning of reflectors	**100**	3	0	3
	PC2. check the reflectors for broken mirrors and reflectivity of the mirrors in and report to superiors		8	3	5
	PC3. Check the receivers for damage and report to the superiors		8	3	5
	PC4. check the receivers for black coating/ selective coating and in case of fading of paint, paint it with the black paint provided by the manufacturers for Scheffler and		8	3	5

	Arun and replace with new receiver tube in case of PT and FLR				
	PC5. check the receiver pipes , receivers and heat delivery pipes for scale formation periodically and carry out de-scaling of pipes with descaling chemicals using descalar system		8	3	5
	PC6. clean and rinse the circulation pump as per relevant industry practices		8	3	5
	PC7. check for screwed connections of piping and containers and tighten if required		7	3	4
	PC8. check for leaks from circulation pipes and repair or replace the leak as well as the insulation on the pipe		5	2	3
	PC9. replace the resin and filters in the RO system periodically		8	3	5
	PC10. calibrate the temperature, pressure sensors and flow meters and other gauges etc. periodically		8	3	5
	PC11. check the sensors, tighten the connecting wires and replace the sensors, in case are found non- functional		7	3	4
	PC12. lubricate all moving parts of the tracking drive system periodically		7	3	4
	PC13. check the electrical connections of the drive motor		7	3	4
	PC14. undertake structural painting to improve life span of the system		8	3	5
		TOTAL	**100**	**38**	**62**
SGJ/N0601 Maintain personal health & safety at solar thermal project site	PC1. identify corporate policies required for workplace safety	**50**	2	1	1
	PC2. identify requirements for safe work area and create a safe work environment		3	2	1
	PC3. identify contact person when workplace safety policies are violated		1	1	0
	PC4. provide information about incident/violation		1	1	0
	PC5. identify the location of first aid materials and administer first aid		2	1	1
	PC6. identify the personal protection equipment required for specific locations on-site		3	2	1
	PC7. identify expiry dates and wear & tear issues of specified equipment		2	1	1
	PC8. demonstrate safe and accepted practices for personal protection		3	2	1
	PC9. identify environmental hazards associated with the project site		2	1	1
	PC10. identify heat and mechanical hazards		4	2	2
	PC11. identify personal safety hazards or work site hazards and mitigate hazards		4	2	2
	PC12. select tools, equipment and testing devices needed to carry out the work		4	2	2

	PC13. demonstrate safe and proper use of required tools and equipment		4	2	2
	PC14. check access from ground to work area to ensure it is safe and in accordance with requirements		2	1	1
	PC15. reassess risk control measures, as required, in accordance with changed work practices and/or site conditions and undertake alterations		2	2	0
	PC16. inspect/install fall protection and perimeter protection equipment ensuring adequacy for work and conformance to regulatory requirements		4	2	2
	PC17. identify approved methods of moving tools and equipment to work area and minimize potential hazards associated with tools at heights		2	1	1
	PC18. select and install appropriate signs and barricades		2	1	1
	PC19. place tools and materials to eliminate or minimize the risk of items being knocked down		1	1	0
	PC20. dismantle plant safely in accordance with sequence and remove from worksite to clear work area		2	1	1
		TOTAL	**50**	**29**	**21**
SGJ/N0120 Work effectively with others	PC1. accurately pass on information to the authorized persons who require it and within agreed timescale and confirm its receipt	**50**	4	2	2
	PC2. assist others in performing tasks in a positive manner where required and possible		4	2	2
	PC3. consult and assist others to maximize effectiveness and efficiency in carrying out tasks		4	2	2
	PC4. display appropriate communication etiquette while working		6	3	3
	PC5. display active listening skills while interacting with others at work		4	2	2
	PC6. demonstrate responsible and disciplined behaviours at the workplace		4	2	2
	PC7. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		3	1	2
	PC8. identify the need for common grounds with clients, team members, etc. and negotiate in an effective manner to achieve the same		3	1	2
	PC9. consider and respect the opinions, creativity, values, beliefs and perspectives of others		4	2	2

	PC10. ensure collaboration and group participation to achieve common goals		6	3	3
	PC11. promote a friendly, co-operative environment that is conducive to employee's sense of belonging		4	2	2
	PC12. facilitate an understanding and appreciation of the differences among team members		4	2	2
		TOTAL	**50**	**24**	**26**

Options **Option 1. NOS: SGJ/N0111 Entrepreneurship Skills**					
Total Marks: 100				**Marks Allocation**	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Mark**	**Out Of**	**Theory**	**Skills Practical**
SGJ/ N0111 Entrepreneurship Skills	PC1. describe the process for setting up a new venture	**100**	8	4	4
	PC2. identify the key ingredients of a business plan		12	5	7
	PC3. distinguish between fixed and working capital requirements		8	3	5
	PC4. describe the components of a loan application for fund raising		8	4	4
	PC5. demonstrate good etiquettes and manners while communicating with the client		8	4	4
	PC6. demonstrate the importance of time management		8	4	4
	PC7. demonstrate leadership skills and effective resource management techniques		8	4	4
	PC8. demonstrate the use of MS word and MS excel for preparing a proposal		10	4	6
	PC9. prepare a workable presentation for marketing and business development		10	4	6
	PC10. choose the right buyer in a given situation of market parameters		10	4	6
	PC11. identify the challenges and risks for new entrepreneurs and the possible mitigation measures		10	5	5
		TOTAL	**100**	**45**	**55**

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