Distributed Renewable Solar Energy Technician Skill Standards

TEXAS WORKFORCE INVESTMENT COUNCIL

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Critical Work Function	Key Activity	Key Activity	Key Activity	Key Activity	Key Activity
1. Perform Site Assessment	1.1 Consult with customer	1.2 Determine appropriate equipment locations	1.3 Create preliminary design of system	1.4 Develop job specification	
2. Create Final Design	2.1 Calculate system energy output	2.2 Calculate sizing of balance of system	2.3 Generate drawings and parts lists		
3. Coordinate Resources	3.1 Procure components	3.2 Apply for necessary permits	3.3 Schedule resources	3.4 Stage Materials	
4. Install System	4.1 Follow safety procedures	4.2 Install structural components	4.3 Install plumbing components	4.4 Install electrical components	4.5 Commission system
5. Maintain System	5.1 Monitor system performance	5.2 Respond to customer calls	5.3 Perform scheduled maintenance		

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Critical Work Function **1. Perform Site Assessment**		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge**	**Conditions**
1.1 Consult with customer	1.1.1 Customer questionnaire is complete to company specifications 1.1.2 All possible information necessary to conduct preliminary design is gathered 1.1.3 Customer feedback indicates readiness to proceed 1.1.4 Site point of contact coordination is evident through project-appropriate indicators (verbal, written)	Electrical systems (AC/DC) Mechanical systems Plumbing systems Pumps and pump theory Energy sources Blueprints and schematics Wiring diagrams	Laptop computer Blueprints, schematics, wiring diagrams Equipment mfr. manuals
1.2 Determine appropriate equipment locations	1.2.1 Equipment is proposed at appropriate orientation (slope, tilt, angle) for efficient production 1.2.2 Proposed installation meets local and national code requirements appropriate to system type 1.2.3 Proposed system fits the space constraints of the roof	Electrical systems (AC/DC) Mechanical systems Plumbing systems Pumps and pump theory Energy sources Blueprints and schematics Wiring diagrams	Hand tools Blueprints, schematics, wiring diagrams
1.3 Create preliminary design of system	1.3.1 Major equipment is identified and listed, as required by company procedures 1.3.2 Preliminary costs are shown to be comprehensive of material, labor, etc. 1.3.3 Design meets all parameters required by customer and/or builder such as hot water volume or electric load generated 1.3.4 System interconnection points are properly identified	Electrical systems (AC/DC) Mechanical systems Plumbing systems Pumps and pump theory Energy sources Blueprints and schematics Wiring diagrams	Laptop computer Blueprints, schematics, wiring diagrams Equipment mfr. manuals
1.4 Develop job specification	1.4.1 Site accessibility concerns are identified 1.4.2 Job specifications meet parameters defined in the system design 1.4.3 Specification identifies safety concerns and indicates appropriate precautions as well as appropriate number of crew members and/or subcontractors required for the job 1.4.4 Final site drawing is included with job specification materials	Electrical systems (AC/DC) Mechanical systems Plumbing systems Energy sources Blueprints and schematics Wiring diagrams	Laptop computer

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 1: Perform site assessment

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occupational Title: Distributed Renewable Solar Energy Technician																
CWF 1 Perform Site Assessment																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Information	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adaptability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
4	4	4	4	4	4	3	3	3	2	2	2	2	3	3	4	3

Statement of Assessment for Critical Work Function 1: Perform site assessment

The statements of assessment can do any of several things:

- *Define tools or strategies that industry could use to assess the level of competency a worker has attained in a particular critical work function.*
- *Define for trainers and educators how to assess the level of competency a student has attained relevant to the critical work function.*
- *Define the level of mastery of the critical work function that indicates that a worker or student has achieved an entry-, intermediate-, or advanced level of mastery of a critical work function.*

A. Tests could include:

1) Multiple choice and essay questions that demonstrate an understanding of knowledge being assessed.
2) Preparation and justification of a reasonable solution to a problem scenario.

B. Hands-on exercises or simulations to demonstrate acquisition of knowledge and skills that could:

1) Apply relevant knowledge or skills
2) Focus on the application of knowledge and skills to a new situation
3) Demonstrate an ability to plan, organize, and create a product, service, or an event.
4) Illustrate by individual performance the attained levels of knowledge and skills.
5) Include observation of events, groups, and individuals that focuses on the relevant traits of the skill in question

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Occupational Title: Distributed Renewable Solar Energy Technician			
Critical Work Function **2. Create Final Design**		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge**	**Conditions**
2.1 Calculate system energy output	2.1.1 Energy production by installed system meets the load use estimates 2.1.2 Installed system footprint is sufficient for the required energy output of the system	Electrical systems (AC/DC) Mechanical systems Plumbing systems Pumps and pump theory Energy sources Blueprints and schematics Wiring diagrams	Laptop computer Blueprints, schematics, wiring diagrams Equipment mfr. manuals
2.2 Calculate sizing of balance of system	2.2.1 Proposed balance of system meets national and local plumbing and/or electrical code requirements for safety and operation 2.2.2 Functional integration of equipment meets industry best practices and FSEC (Florida Solar Energy Center) criteria 2.2.3 System design meets the reliability parameters defined in manufacturer's specification	Electrical systems (AC/DC) Mechanical systems Plumbing systems Pumps and pump theory Blueprints and schematics Wiring diagrams	Laptop computer Blueprints, schematics, wiring diagrams Equipment mfr. manuals
2.3 Generate drawings and parts lists	2.3.1 Solar thermal drawing meets SRCC OG-300 specification for operation and efficiency. 2.3.2 Photo voltaic drawing content reflects national electric code (Article 690) standards 2.3.3 Drawings reflect accurate depiction of system to be installed	Electrical systems (AC/DC) Mechanical systems Plumbing systems Energy sources Blueprints and schematics Wiring diagrams	Laptop computer Blueprints, schematics, wiring diagrams Equipment mfr. manuals

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 2: Create Final Design

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occupational Title: Distributed Renewable Solar Energy Technician																
CWF 2 Create Final Design																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Information	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adaptability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
3	3	3	4	4	4	3	2	3	3	2	3	3	3	3	4	3

Statement of Assessment for Critical Work Function 2: Create Final Design

The statements of assessment can do any of several things:

- *Define tools or strategies that industry could use to assess the level of competency a worker has attained in a particular critical work function.*
- *Define for trainers and educators how to assess the level of competency a student has attained relevant to the critical work function.*
- *Define the level of mastery of the critical work function that indicates that a worker or student has achieved an entry-, intermediate-, or advanced level of mastery of a critical work function.*

A. Tests could include:

1) Multiple choice and essay questions that demonstrate an understanding of knowledge being assessed.
2) Preparation and justification of a reasonable solution to a problem scenario.

B. Hands-on exercises or simulations to demonstrate acquisition of knowledge and skills that could:

1) Apply relevant knowledge or skills
2) Focus on the application of knowledge and skills to a new situation
3) Demonstrate an ability to plan, organize, and create a product, service, or an event.
4) Illustrate by individual performance the attained levels of knowledge and skills.
5) Include observation of events, groups, and individuals that focuses on the relevant traits of the skill in question.

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Occupational Title: Distributed Renewable Solar Energy Technician			
Critical Work Function **3. Coordinate Resources**		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge**	**Conditions**
3.1 Procure components	3.1.1 Materials are sourced from approved vendors 3.1.2 Inventory checklist reflects parts list generated for final design 3.1.3 Purchase orders are complete per company policy and accurately reflect inventory checklist 3.1.4 Shipping dates are documented per company requirements 3.1.5 Order confirmation is received and reported as required 3.1.6 Expenditures are documented per company requirements and are within budget	Electrical systems (AC/DC) Mechanical systems Plumbing systems Blueprints and schematics Wiring diagrams	Laptop computer
3.2 Apply for necessary permits	3.2.1 Documentation of permission from jurisdiction having authority (JHA) to perform intended duties is produced 3.2.2 Interconnection application is completed per utility requirements 3.2.3 Release from local building inspector is complete per building authority requirements	Electrical systems (AC/DC) Blueprints and schematics Wiring diagrams	Laptop computer Blueprints, schematics, wiring diagrams National Electric Code handbook
3.3 Schedule resources	3.3.1 Equipment sourced through lease/rental is delivered to site as needed 3.3.2 Appropriate job staffing levels are defined with regard to head count, specialty skills, and payroll budget 3.3.3 Appropriate subcontractors are engaged per company policy	Blueprints and schematics	Laptop computer

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Occupational Title: Distributed Renewable Solar Energy Technician			
Critical Work Function **3. Coordinate Resources**		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge**	**Conditions**
3.4 Stage materials	3.4.1 Tools and supplies being staged are appropriate to the project and reflect the inventory checklist and the parts list generated for final design 3.4.2 All necessary materials are available at start of job 3.4.3 Materials are loaded/stored in first in/last out order as defined by company procedures to ensure efficient access 3.4.4 Proper safety precautions for conducting repairs and rigging procedures (as necessary) are demonstrated	Blueprints and schematics	Safety equipment (personal and job safety)

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 3: Coordinate Resources

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occupational Title: Distributed Renewable Solar Energy Technician																
CWF 3. Coordinate Resources																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Information	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adaptability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	2

Statement of Assessment for Critical Work Function 3: Coordinate Resources

The statements of assessment can do any of several things:

- *Define tools or strategies that industry could use to assess the level of competency a worker has attained in a particular critical work function.*
- *Define for trainers and educators how to assess the level of competency a student has attained relevant to the critical work function.*
- *Define the level of mastery of the critical work function that indicates that a worker or student has achieved an entry-, intermediate-, or advanced level of mastery of a critical work function.*

A. Tests could include:

1) Multiple choice and essay questions that demonstrate an understanding of knowledge being assessed.
2) Preparation and justification of a reasonable solution to a problem scenario.

B. Hands-on exercises or simulations to demonstrate acquisition of knowledge and skills that could:

1) Apply relevant knowledge or skills
2) Focus on the application of knowledge and skills to a new situation
3) Demonstrate an ability to plan, organize, and create a product, service, or an event.
4) Illustrate by individual performance the attained levels of knowledge and skills.
5) Include observation of events, groups, and individuals that focuses on the relevant traits of the skill in question.

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Occupational Title: Distributed Renewable Solar Energy Technician			
Critical Work Function **4. Install System**		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge**	**Conditions**
4.1 Follow safety procedures	4.1.1 Site is clean and clear of debris and hazards 4.1.2 All OSHA and/or verbal safety procedures are followed 4.1.3 Site safety information is communicated and posted, as required by company policy 4.1.4 Safety equipment is implemented properly 4.1.5 Site safety inspections are conducted, as required by company safety program (frequency, etc.) 4.1.6 Unsafe conditions are reported, remedied, and documented 4.1.7 Incidents and accidents are reported and documented, as required by company policy 4.1.8 Responses to emergencies comply with safety practices and company safety program	Electrical systems (AC/DC) Mechanical systems Plumbing systems	Safety equipment (personal and job safety) Equipment mfr. manuals

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Occupational Title: Distributed Renewable Solar Energy Technician			
Critical Work Function **4. Install System**		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge**	**Conditions**
4.2 Install structural components	4.2.1 Structural components are installed per manufacturer specifications and per design specifications 4.2.2 Deviations from final design are recorded per company policy 4.2.3 Visual check indicates structural components installed accurately 4.2.4 Devices, clamps, screws, etc. are torqued according to manufacturer instructions	Electrical systems (AC/DC) Mechanical systems Blueprints and schematics Wiring diagrams	Hand tools Power tools Safety equipment (personal and job safety) Grounding equipment Electrical supplies Rigging equipment Hoisting equipment Work vehicles (including forklift, etc) Materials handling vehicles Blueprints, schematics, wiring diagrams Equipment mfr. Manuals Glues, adhesives, sealants, fasteners Torque wrench
4.3 Install plumbing components	4.3.1 Components are installed per SRCC-OG300 and national plumbing code 4.3.2 Visual check indicates plumbing components installed accurately and in a neat and aesthetically pleasing manner 4.3.3 Pressure check indicates system holds steady pressure over time 4.3.4 Deviations from final design are recorded per company policy 4.3.5 System interconnection points are installed under the supervision or sign-off of a licensed professional	Plumbing systems Pumps and pump theory Soldering techniques Blueprints and schematics Wiring diagrams	Hand tools Power tools Safety equipment (personal and job safety) Plumbing and pipefitting materials Rigging equipment Hoisting equipment Work vehicles (including forklift, etc) Material handling vehicles Blueprints, schematics, wiring diagrams Equipment mfr. manuals Cleaning equipment Glues, adhesives, sealants, fasteners

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Occupational Title: Distributed Renewable Solar Energy Technician			
Critical Work Function **4. Install System**		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge**	**Conditions**
4.4 Install electrical components	4.4.1 Electrical components are installed per manufacturer specifications and per design specifications and per National Electric Code 4.4.2 System voltage and amperage meet the specifications defined in the system final design 4.4.3 System meets expected power output (wattage) 4.4.4 Installation meets national electric code (Article 690) requirements 4.4.5 Visual check indicates electrical components are installed accurately and in a neat and aesthetically pleasing manner 4.4.6 Deviations from final design are recorded per company policy 4.4.7 System interconnection points are installed under the supervision or sign-off of a licensed professional	Electrical systems (AC/DC) Motor control circuits Energy sources Blueprints and schematics Wiring diagrams	Hand tools Power tools Safety equipment (personal and job safety) Grounding equipment Voltage/power test equipment Electrical/electronic test equipment Electrical supplies Rigging equipment Hoisting equipment Work vehicles (including forklift, etc) Blueprints, schematics, wiring diagrams Equipment mfr. manuals

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Occupational Title: Distributed Renewable Solar Energy Technician			
Critical Work Function **4. Install System**		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge**	**Conditions**
4.5 Commission system	4.5.1 Damage to or incorrect placement of equipment is reported and repaired or corrected 4.5.2 System operates to manufacturer performance specifications for temperature 4.5.3 System sensors are accurate to manufacturer specification 4.5.4 System is mechanically sound, tightened down with no loose ends 4.5.5 System meets expected power output and no inverter error codes are indicated 4.5.6 System meets all requirements for authority having jurisdiction (AHJ) 4.5.7 Inspector signs off on green tag 4.5.8 Customer acceptance of system is documented per company policy	Electrical systems (AC/DC) Mechanical systems Plumbing systems Energy sources Blueprints and schematics Wiring diagrams	Voltage/power test equipment Electrical/electronic test equipment Blueprints, schematics, wiring diagrams Equipment mfr. manuals

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 4: Install System

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occupational Title: Distributed Renewable Solar Energy Technician																
CWF 4. Install System																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Information	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adaptability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
3	3	3	3	4	4	4	3	3	4	3	3	3	2	3	3	3

Statement of Assessment for Critical Work Function 4: Install System

The statements of assessment can do any of several things:

- *Define tools or strategies that industry could use to assess the level of competency a worker has attained in a particular critical work function.*
- *Define for trainers and educators how to assess the level of competency a student has attained relevant to the critical work function.*
- *Define the level of mastery of the critical work function that indicates that a worker or student has achieved an entry-, intermediate-, or advanced level of mastery of a critical work function.*

A. Tests could include:

1) Multiple choice and essay questions that demonstrate an understanding of knowledge being assessed.
2) Preparation and justification of a reasonable solution to a problem scenario.

B. Hands-on exercises or simulations to demonstrate acquisition of knowledge and skills that could:

1) Apply relevant knowledge or skills
2) Focus on the application of knowledge and skills to a new situation
3) Demonstrate an ability to plan, organize, and create a product, service, or an event.
4) Illustrate by individual performance the attained levels of knowledge and skills.
5) Include observation of events, groups, and individuals that focuses on the relevant traits of the skill in question.

Occupational Title: Distributed Renewable Solar Energy Technician			
Critical Work Function **5. Maintain System**		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge**	**Conditions**
5.1 Monitor system performance	5.1.1 System performance continues to meet production expectations as defined in system design 5.1.2 System performance logged and documented per company procedure	Electrical systems (AC/DC) Plumbing systems Pumps and pump theory Motor control circuits Energy sources Blueprints and schematics Wiring diagrams	Laptop computer Voltage/power test equipment Electrical/electronic test equipment Monitoring devices Equipment mfr. manuals
5.2 Respond to customer calls	5.2.1 Service calls are processed and documented, as required by company policy 5.2.2 Call response time matches priority of service need 5.2.3 Customer satisfaction ratings indicate that responsiveness levels meet service expectations 5.2.4 Repairs are resolved per manufacturer specification	Electrical systems (AC/DC) Mechanical systems Plumbing systems Blueprints and schematics Wiring diagrams	Laptop computer Blueprints, schematics, wiring diagrams Equipment mfr. manuals
5.3 Perform scheduled maintenance	5.3.1 Maintenance checklist is complete and current 5.3.2 Maintenance record meets timeliness and frequency schedule, as required by manufacturer specification 5.3.3 Customer satisfaction ratings indicate that system reliability meets service expectations	Electrical systems (AC/DC) Mechanical systems Plumbing systems Pumps and pump theory Motor control circuits Energy sources Blueprints and schematics Wiring diagrams	Hand tools Laptop computer Safety equipment (personal and job safety) Voltage/power test equipment Electrical/electronic test equipment Blueprints, schematics, wiring diagrams Equipment mfr. manuals

DISTRIBUTED RENEWABLE SOLAR ENERGY TECHNICIAN SKILL STANDARDS

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 5: Maintain System

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occupational Title: Distributed Renewable Solar Energy Technician																
CWF 5. Maintain System																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Information	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adaptability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
3	3	3	4	4	3	3	2	3	2	2	2	2	2	3	3	3

Statement of Assessment for Critical Work Function 5: Maintain System

The statements of assessment can do any of several things:

- *Define tools or strategies that industry could use to assess the level of competency a worker has attained in a particular critical work function.*
- *Define for trainers and educators how to assess the level of competency a student has attained relevant to the critical work function.*
- *Define the level of mastery of the critical work function that indicates that a worker or student has achieved an entry-, intermediate-, or advanced level of mastery of a critical work function.*

A. Tests could include:

1) Multiple choice and essay questions that demonstrate an understanding of knowledge being assessed.
2) Preparation and justification of a reasonable solution to a problem scenario.

B. Hands-on exercises or simulations to demonstrate acquisition of knowledge and skills that could:

1) Apply relevant knowledge or skills
2) Focus on the application of knowledge and skills to a new situation
3) Demonstrate an ability to plan, organize, and create a product, service, or an event.
4) Illustrate by individual performance the attained levels of knowledge and skills.
5) Include observation of events, groups, and individuals that focuses on the relevant traits of the skill in question.