Fuel Cell Systems Technician Skill Standards

TEXAS WORKFORCE INVESTMENT COUNCIL

Fuel Cell Systems Technician Skill Standards

Critical Work Function	Key Activity	Key Activity	Key Activity	Key Activity	Key Activity	Key Activity
1. Commission and start up fuel cells	1.1 Verify quality and completeness of fuel cell system installation	1.2 Install upgrades and retrofits as required	1.3 Conduct pre-start verifications	1.4 Perform functional tests		
2. Maintain and follow safety procedures	2.1 Maintain tools and equipment	2.2 Communicate site safety information	2.3 Conduct site safety inspections	2.4 Respond to emergencies		
3. Perform diagnostic and repair activities	3.1 Diagnose malfunctions	3.2 Repair malfunctions	3.3 Test and verify system performance after repairs			
4. Maintain fuel cell water treatment systems	4.1 Test incoming water quality	4.2 Monitor and regulate make-up water system	4.3 Adjust and repair water system components			
5. Maintain fuel cell thermal management systems	5.1 Monitor and regulate coolant system	5.2 Monitor and regulate freeze protection systems	5.3 Adjust or repair thermal management system components	5.4 Maintain integrity of insulation throughout fuel cell systems		
6. Maintain fuel cell electrical systems	6.1 Adjust or repair electronic control system	6.2 Adjust or repair balance of plant pumps, motors, blowers) equipment	6.3 Monitor & regulate performance of power conditioning equipment	6.4 Maintain power plant configuration records		
7. Maintain fuel cell air and internal fuel delivery systems	7.1 Maintain processed air delivery system	7.2 Maintain cabinet ventilation system	7.3 Monitor & regulate internal fuel system components	7.4 Maintain purging system	7.5 Maintain fuel delivery (from utility) system	7.6 Monitor and regulate fuel quality
8. Perform major overhauls of fuel cells	8.1 Prepare unit for overhaul	8.2 Overhaul the fuel cell	8.3 Conduct pre-start verification	8.4 Perform functional tests		
9, Decommission fuel cells	9.1 Shut system down for decommissioning	9.2 Dismantle and remove unit	9.3 Perform site restoration			

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **1. Commission and start up fuel cells**		**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. Verify quality and completeness of fuel cell system installation	1.1.1. Site point of contact (POC) coordination is evident through project-appropriate indicators (verbal, written) 1.1.2. Local utilities are contacted as required by connection agreement 1.1.3. Signed connection agreement with local utility is followed 1.1.4. Release from local building inspector is complete 1.1.5. Site is cleaned and clear of safety hazards 1.1.6. All OSHA and/or verbal safety procedures are followed 1.1.7. Damage to or incorrect placement of equipment is reported 1.1.8. Deviations from design in installation or as-built drawings is recorded per company policy 1.1.9. Site log is current and up to date	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Power delivery Project management concepts/terminology Mechanical systems Motor control circuits FC electrical and safety codes & standards Electronics Grid interconnectivity Application specific safety procedures Electrical backup systems Control systems design Basic power system coordination Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Office computer application software Unit controller software Power and hand tools Pressure meters Conductivity testing equipment Voltage meter Multimeter Amp meter Safety equipment Personal protective equipment Personal technical library

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **1. Commission and start up fuel cells**		**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**
1.2. Install upgrades / retrofits as required	1.2.1 Pertinent upgrades are installed according to manufacturer specification 1.2.2 Upgrades perform according to manufacturer specification 1.2.3 Site log is current and up to date	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Mechanical systems Motor control circuits Programmable logic controllers FC electrical and safety codes & standards Electronics Application specific safety procedures Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Office computer application software Unit controller software Power and hand tools Tubing bender Safety equipment Personal protective equipment Cell phone Personal technical library

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **1. Commission and start up fuel cells**		**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**
1.3. Conduct pre-start verifications	1.3.1 Shipped items are verified and installed per manufacturer instruction 1.3.2 Power plant interfaces are properly connected to electrical power distribution units 1.3.3 Fluid levels are at manufacturer-specified levels 1.3.4 Documented safety procedures are followed 1.3.5 Customer has been trained per manufacturer recommendation including site-specific safety training 1.3.6 Site log is current and up to date 1.3.7 Pre-start checklist is completed per company policy	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Power delivery Project management concepts/terminology Mechanical systems Motor control circuits FC electrical and safety codes & standards Electronics Grid interconnectivity Application specific safety procedures Control systems design Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Office computer application software Unit controller software Oscilloscope Pressure meters Conductivity testing equipment Turbidity testing equipment Voltage meter Multimeter Amp meter Safety equipment Personal protective equipment Cell phone Personal technical library

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **1. Commission and start up fuel cells**		**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**
1.4. Perform functional tests	1.4.1 Unit is started up according to manufacturer instructions 1.4.2 Customer-specific acceptance testing is conducted according to customer instruction 1.4.3 Remote data communication is operational 1.4.4 Documented safety procedures are followed 1.4.5 Service calls are processed and documented as required by company policy 1.4.6 All systems function per manufacturer design 1.4.7 Acceptance test sign-off by customer or customer agent 1.4.8 Site log is current and up to date	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Power delivery Project management concepts/terminology Mechanical systems Motor control circuits FC electrical and safety codes & standards Electronics Grid interconnectivity Application specific safety procedures Electrical backup systems Control systems design Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Office computer application software Unit controller software Pressure meters Conductivity testing equipment Voltage Meter Multimeter Amp meter Safety equipment Personal protective equipment Cell phone Personal technical library

Fuel Cell Systems Technician Skill Standards

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 1: Commission and start up fuel cells

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: Fuel Cell Systems Technician																
CWF 1 Commission and start up fuel cells																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Info	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adapt-ability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Math	Science
3	2	3	3	4	4	4	2	3	3	3	3	3	2	2	3	3

Statement of Assessment for Critical Work Function 1: Commission and start up fuel cells

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.

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **2. Maintain and follow safety procedures**		**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 Maintain tools and equipment	2.1.1 Tools and equipment (including fire extinguishers, test equipment, and PPE) are calibrated and in safe working order based on manufacturer specifications 2.1.2 Tools and equipment are stored in designated area and are easily accessible 2.1.3 Technical manuals are current and technical services bulletins are incorporated as distributed by the manufacturer 2.1.4 Site log is current and up to date	FC electrical and safety codes & standards Application specific safety procedures Product knowledge Quality control Testing and measuring procedures Safety training	Power and hand tools Safety equipment Personal protective equipment Personal technical library
2.2 Communicate site safety information	2.2.1 Site safety information is communicated and posted as required by company policy 2.2.2 MSDS Book is updated in compliance with state requirements 2.2.3 Site log is current and up to date	Project management concepts/terminology FC electrical and safety codes & standards Application specific safety procedures Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Office computer application software Cell phone
2.3 Conduct site safety inspections	2.3.1 Site safety inspections are conducted as required by company safety program (frequency, etc.) 2.3.2 Unsafe conditions are reported and remedied and documented 2.3.3. Site is clean and free of debris 2.3.4 Site log is current and up to date	Ability to read schematics, blueprints, etc. Electrical systems, symbols, terminology Project management concepts/terminology FC electrical and safety codes & standards Application specific safety procedures Product knowledge Quality control Testing and measuring procedures Safety training	Safety equipment Personal protective equipment Cell phone Personal technical library

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **2. Maintain and follow safety procedures**		**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**
2.4 Respond to emergencies	2.4.1 Incidents and accidents are reported and documented as required by company policy 2.4.2 Site log is current and up to date 2.4.3 Responses to emergencies comply with safety practices and company safety program 2.4.4 Emergency response adequately addresses emergency situation, leaving fuel cell and site interconnections in a safe configuration.	Ability to read schematics, blueprints, etc. Electrical systems, symbols, terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Power delivery Project management concepts/terminology Mechanical systems Motor control circuits Programmable logic controllers FC electrical and safety codes & standards Electronics Grid interconnectivity Application specific safety procedures Electrical backup systems Control systems design Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Office computer application software Unit controller software Power and hand tools Pressure meters Conductivity testing equipment Turbidity testing equipment Gas Chromatograph Voltage meter Multimeter Amp meter RF wattmeter Safety equipment Personal protective equipment Grounding equipment Cell phone Personal technical library

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 2: Maintain and follow safety procedures

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: Fuel Cell Systems Technician																
CWF 2 Maintain and follow safety procedures																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Info	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adapt-ability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Math	Science
3	2	3	3	2	3	2	3	2	2	3	3	2	2	3	2	2

Statement of Assessment for Critical Work Function 2: Maintain and follow safety procedures

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.

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **3. Perform diagnostic and repair activities**		**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 Diagnose malfunctions	3.1.1 Tests are performed in attempt to duplicate problem with results documented 3.1.2 Anomalies are accurately characterized and documented 3.1.3 Malfunction is identified and recorded	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Power delivery Mechanical systems Motor control circuits Programmable logic controllers FC electrical and safety codes & standards Electronics Grid interconnectivity Fiber optics Wireless systems Application specific safety procedures Electrical backup systems Control systems design Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Office computer application software Unit controller software Power and hand tools Oscilloscope Pressure meters Conductivity testing equipment Turbidity testing equipment Refractometer Gas chromatograph Voltage meter Megger Multimeter Amp meter Multifunction test sets RF wattmeter Safety equipment Personal protective equipment Grounding equipment Cell phone Personal technical library

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **3. Perform diagnostic and repair activities**		**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**
3.2 Repair malfunctions	3.2.1 Service calls are processed and documented as required by company policy 3.2.2 Proper safety precautions for conducting repairs and rigging procedures (as necessary) are demonstrated 3.2.3 Tools appropriate to the repair work are used 3.2.4 Unit is in a condition that is safe and appropriate for the repair work being performed 3.2.5 Proper lockout/tagout procedures are demonstrated 3.2.6 Removed waste and parts are processed according to regulations 3.2.7 Disposal log is current and up to date	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Mechanical systems Motor control circuits Programmable logic controllers FC electrical and safety codes & standards Electronics Grid interconnectivity Application specific safety procedur Electrical backup systems Control systems design Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Safety equipment Personal protective equipment Grounding equipment Cell phone Personal technical library

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **3. Perform diagnostic and repair activities**		**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**
3.3 Test and verify system performance after repairs	3,3,1 System performs to manufacturer specifications 3,3,2 Test results are recorded according to company policy 3,3,3 Adjustments made as required for proper operation to specification 3,3,4 Site log is current and up to date 3,3,5 Problem is fixed and all associated anomalies are corrected	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Power delivery Mechanical systems Motor control circuits Programmable logic controllers FC electrical and safety codes & standards Electronics Grid interconnectivity Application specific safety procedures Electrical backup systems Control systems design Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Unit controller software Pressure meters Multimeter Office computer application software Conductivity testing equipment Voltage meter Amp meter Personal protective equipment Cell phone Personal technical library Oscilloscope Turbidity testing equipment Gas chromatograph RF wattmeter Safety equipment

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 3: Perform diagnostic and repair activities

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: Fuel Cell Systems Technician																
CWF 3. Perform diagnostic and repair activities																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Info	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adapt-ability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Math	Science
3	3	4	4	4	4	3	2	3	2	2	2	3	3	4	3	3

Statement of Assessment for Critical Work Function 3: Perform diagnostic and repair activities

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.

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **4. Maintain fuel cell water treatment systems**		**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 Test incoming water quality	4,1.1 Water quality is accurately tested and compared to manufacturer's specifications (hardness, turbidity, pH, etc.) 4.1.2 Water quality results are entered into site log 4.1.3 Meters to test utility supply water quality are maintained and used properly 4.1.4 System conductivity sensors are accurate to manufacturer specification 4.1.5 Water quality anomalies are reported as required by company policy	Instrumentation basics Mechanical systems Application specific safety procedures Product knowledge Quality control Testing and measuring procedures Safety training	Turbidity testing equipment Conductivity testing equipment Personal protective equipment
4.2 Monitor and regulate make-up water system	4.2.1 System meets manufacturer specifications for water quality 4.2.2 Movement or relocation of resin bottles done by OSHA standards for weight limitations 4.2.3 Water quality meets manufacturer suggested specifications 4.2.4 Water quality results are entered into site log 4.2.5 Meters to test utility supply water quality are maintained and used properly 4.2.6 System sensors are accurate to manufacturer specification	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Instrumentation basics Mechanical systems Application specific safety procedures Product knowledge Quality control Testing and measuring procedures Safety training	Conductivity testing equipment Personal technical library Turbidity testing equipment Personal protective equipment

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **4. Maintain fuel cell water treatment systems**		**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**
4.3 Adjust and repair water system components	4.3.1 Deionized water tank, filters, and strainers are cleaned according to manufacturer instructions 4.3.2 System is free of water and air leaks 4.3.3 Movement or relocation of resin bottles done by OSHA standards/guidelines 4.3.4 Internal water treatment bottles are changed out per manufacturer specification for water quality	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Instrumentation basics Mechanical systems Application specific safety procedures Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Personal protective equipment Conductivity testing equipment Safety equipment Personal technical library Pressure meters Cell phone

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 4: Maintain fuel cell water treatment systems

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: Fuel Cell Systems Technician																
CWF 4. Maintain fuel cell water treatment systems																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Info	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adapt-ability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Math	Science
2	2	3	3	3	3	3	2	2	2	2	2	2	2	3	2	3

Statement of Assessment for Critical Work Function 4: Maintain fuel cell water treatment systems

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.

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **5. Maintain fuel cell thermal management systems**		**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 and regulate coolant system	5.1.1 Coolant levels are maintained at manufacturer specified levels 5.1.2 System operates to manufacturer performance specifications for temperature 5.1.3 Site log is current and up to date 5.1.4 System sensors are accurate to manufacturer specification	Ability to read schematics, blueprints, etc. Instrumentation basics Mechanical systems Application specific safety procedures Control systems design Basic power system coordination Product knowledge Quality control Testing and measuring procedures Safety training	Power and hand tools Personal protective equipment Personal technical library Office computer application software Pressure meters Safety equipment
5.2 Monitor and regulate freeze protection systems	5.2.1 No freeze damage occurs during times when the system is shut down 5.2.2 Heaters or heat trace low-wattage heaters start as expected at a specified ambient temperature 5.2.3 Site log is current and up to date 5.2.4 System sensors are accurate to manufacturer specification	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Single- and polyphase power distribution Instrumentation basics Mechanical systems Application specific safety procedures Control systems design Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Personal protective equipment Pressure meters Multimeter Personal technical library

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **5. Maintain fuel cell thermal management systems**		**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**
5.3 Adjust or repair thermal management system components	5.3.1 External cooling equipment operates per manufacturer specification 5.3.2 System components are cleaned as required by manufacturer instructions 5.3.3 Maintenance log is updated to reflect repairs/adjustments 5.3.4 Thermostat or aquastat and fan motors operate according to manufacturer's specified ranges for temperature or amperage 5.3.5 Site log is current and up to date 5.3.6 System sensors are accurate to manufacturer specification	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Instrumentation basics Mechanical systems Application specific safety procedures Control systems design Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Pressure meters Personal protective equipment Office computer application software Unit controller software Safety equipment Cell phone Personal technical library
5.4 Maintain integrity of insulation throughout fuel cell system	5.4.1 System operates within temperature parameters 5.4.2 Unit meets OSHA standards for personal protection from heat injury by contact with hot surfaces	Instrumentation basics Motor control circuits Programmable logic controllers Application specific safety procedures Control systems design Basic power system coordination Product knowledge Quality control Testing and measuring procedures Safety training	Power and hand tools Personal protective equipment Safety equipment Personal technical library

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 5: Maintain fuel cell thermal management systems

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: Fuel Cell Systems Technician																
CWF 5. Maintain fuel cell thermal management systems																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Info	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adapt-ability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Math	Science
2	2	3	3	3	3	3	2	2	2	2	2	2	2	3	3	3

Statement of Assessment for Critical Work Function 5: Maintain fuel cell thermal management systems

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.

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **6. Maintain fuel cell electrical systems**		**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**
6.1 Adjust or repair electronic control system	6.1.1 Electrical components, electronics and circuit boards are dust- and moisture-free 6.1.2 Switching components and mechanical switchgear operate in proper sequence 6.1.3 Site log is current and up to date 6.1.4 Communications interface responds upon call 6.1.5 System sensors are accurate to manufacturer specification	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Single- and polyphase power distribution Instrumentation basics Power delivery Motor control circuits Programmable logic controllers FC electrical and safety codes & standards Electronics Fiber optics Wireless systems Application specific safety procedures Electrical backup systems Control systems design Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Unit controller software Power and hand tools Multimeter Oscilloscope Voltage meter Multifunction test sets Safety equipment Personal protective equipment Personal technical library Office computer application software Amp meter RF wattmeter Cell phone

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **6. Maintain fuel cell electrical systems**		**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**
6.2 Adjust or repair balance of plant (pumps, motors, blowers) equipment	6.2.1 AC/DC motors are operational per manufacturer specifications 6.2.2 Electrical enclosures are in good repair, with seals intact, latches and locks operational, enclosure is damage free, etc. 6.2.3 Site log is current and up to date 6.2.4 Electromechanical systems operate according to manufacturer sequence of operations 6.2.5 System sensors are accurate to manufacturer specification	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Power delivery Project management concepts/terminology Mechanical systems Motor control circuits Programmable logic controllers FC electrical and safety codes & standards Electronics Grid interconnectivity Application specific safety procedures Electrical backup systems Control systems design Basic power system coordination Distribution systems Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Personal protective equipment Personal technical library Multimeter Safety equipment Voltage meter Tubing bender

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **6. Maintain fuel cell electrical systems**		**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**
6.3 Monitor and regulate performance of power conditioning equipment	6.3.1 Electrical output operates within grid tolerances 6.3.2 Cell stack operates within manufacturer specifications for voltage output and power output 6.3.3 Electrical components, electronics and circuit boards are dust- and moisture-free 6.3.4 Switching components and mechanical switchgear operate in proper sequence 6.3.5 Site log is current and up to date 6.3.6 System sensors are accurate to manufacturer specification	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Power delivery Motor control circuits Programmable logic controllers FC electrical and safety codes & standards Electronics Grid interconnectivity Application specific safety procedures Electrical backup systems Control systems design Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Multimeter Personal protective equipment Voltage meter Amp meter Multifunction test sets RF wattmeter Safety equipment Personal technical library Office computer application software Unit controller software Oscilloscope Signal generator Frequency counter Grounding equipment Cell phone
6.4 Maintain power plant configuration records	6.4.1 Power plant configuration is up-to-date, recorded, and on file 6.4.2 Site log is current and up to date 6.4.3 Configuration is recoverable after any system shutdown	Project management concepts/terminology Product knowledge Quality control Computer literacy Testing and measuring procedures	Office computer application software Cell phone Personal technical library Unit controller software

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 6: Maintain fuel cell electrical systems

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: Fuel Cell Systems Technician																
CWF 6. Maintain fuel cell electrical systems																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Info	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adapt-ability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Math	Science
3	2	3	4	4	3	3	2	3	2	2	2	2	2	3	3	3

Statement of Assessment for Critical Work Function 6: Maintain fuel cell electrical systems

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.

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **7. Maintain fuel cell air and internal fuel delivery systems**		**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**
7.1 Maintain processed air delivery system	7.1.1 Air Humidity levels meet manufacturer specifications 7.1.2 System pressure is within manufacturer specifications 7.1.3 Air contaminant particle size is within manufacturer specifications 7.1.4 Air components are maintained according to manufacturer recommendations 7.1.5 System sensors are accurate to manufacturer specification 7.1.6 Quantity of 0_2 and $C0_2$ coming from the exhaust vent is within specifications	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Single- and polyphase power distribution Instrumentation basics Mechanical systems Motor control circuits Electronics Application specific safety procedures Control systems design Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Personal protective equipment Power and hand tools Safety equipment Personal technical library Office computer application software Pressure meters Multimeter

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **7. Maintain fuel cell air and internal fuel delivery systems**		**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**
7.2 Maintain cabinet ventilation system	7.2.1 System pressure is within manufacturer specifications 7.2.2 Insulation maintains temperatures within specified ranges and provides protection from high temperature system components 7.2.3 System sensors are accurate to manufacturer specification	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Mechanical systems Motor control circuits FC electrical and safety codes & standards Electronics Application specific safety procedures Control systems design Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Personal protective equipment Personal technical library Pressure meters Multimeter Safety equipment
7.3 Monitor and regulate internal fuel system components	7.3.1 Catalysts are in good working order as indicated by system performance 7.3.2 Incoming fuel meets manufacturer standards for specific unit type 7.3.3 Fuel composition is within manufacturer specification throughout internal fuel delivery system 7.3.4 Fuel system pressure is within manufacturer specifications 7.3.5 Fuel flow regulators and valves are working per manufacturer specifications or are within specified ranges as indicated by fuel system performance 7.3.6 System sensors are accurate to manufacturer specification	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Instrumentation basics Mechanical systems Motor control circuits FC electrical and safety codes & standards Electronics Application specific safety procedures Control systems design Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Personal protective equipment Personal technical library Safety equipment Office computer application software Unit controller software Pressure meters Gas chromatograph

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **7. Maintain fuel cell air and internal fuel delivery systems**		**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**
7.4 Maintain purging system	7.4.1 Fuel composition is within manufacturer specification throughout internal fuel delivery system 7.4.2 Sufficient purge material is available for shutdown and startup 7.4.3 Shutdown occurs safely, fuel system operates adequately, and machine confirms that purging has occurred 7.4.4 System sensors are accurate to manufacturer specification 7.4.5 Purging system is free from leaks, and pressures are within manufacturer specifications	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Single- and polyphase power distribution Instrumentation basics Mechanical systems Motor control circuits FC electrical and safety codes & standard Electronics Application specific safety procedures Control systems design Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Personal protective equipment Pressure meters Safety equipment Personal technical library Office computer application software
7.5 Maintain fuel delivery (from utility) system	7.5.1 Fuel delivered to the internal fuel system is within specified ranges for temperature, pressure, and flow 7.5.2 Meters and regulators operate within specified ranges 7.5.3 Quantity of 0_2 and $C0_2$ coming from the exhaust vent is within specifications	Ability to read schematics, blueprints, etc. Instrumentation basics Mechanical systems Application specific safety procedures Control systems design Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Pressure meters Personal protective equipment Personal technical library Safety equipment

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **7. Maintain fuel cell air and internal fuel delivery systems**		**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**
7.6 Monitor and regulate fuel quality	7.6.1 Gas samples are taken at specified intervals and as required 7.6.2 Both internal and external gas quality is within manufacturer specification for peak system performance 7.6.3 Reformer efficiency meets manufacturer specifications 7.6.4 Quantity of 0_2 and $C0_2$ coming from the exhaust vent is within specifications	Ability to read schematics, blueprints, etc. Instrumentation basics Catalysts Mechanical systems Application specific safety procedures Product knowledge Quality control Testing and measuring procedures Safety training	Pressure meters Gas chromatograph Safety equipment Personal protective equipment Personal technical library Power and hand tools

Fuel Cell Systems Technician Skill Standards

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 7: Maintain fuel cell air and internal fuel delivery systems

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: Fuel Cell Systems Technician																
CWF 7. Maintain fuel cell air and internal fuel delivery systems																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Info	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adapt-ability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Math	Science
2	2	3	4	4	3	3	2	2	2	2	2	2	2	3	3	3

Statement of Assessment for Critical Work Function 7: Maintain fuel cell air and internal fuel delivery systems

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.

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **8. Perform major overhauls of fuel cells**		**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**
8.1 Prepare unit for overhaul	8.1.1 Shut down sequence protects fuel cell systems and components 8.1.2 Fuel cell is secured (locked out) per OSHA safety regulations 8.1.3 All fuel cell systems are properly drained in accordance with all applicable HAZMAT guidelines and requirements 8.1.4 Safety class or orientation is given to all personnel engaged in overhaul activities per company policy	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Power delivery Catalysts Project management concepts/terminology Mechanical systems Motor control circuits Programmable logic controllers FC electrical and safety codes & standards Electronics Application specific safety procedures Electrical backup systems Control systems design Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Safety equipment Personal protective equipment Multimeter Personal technical library Unit controller software Pressure meters Voltage meter Rigging equipment Cell phone

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **8. Perform major overhauls of fuel cells**		**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**
8.2 Overhaul the fuel cell	8.2.1 All components removed are disposed of properly per company policy, manufacturer requirements, and all applicable environmental regulations and codes 8.2.2 Hazardous materials are removed and discarded in compliance with all applicable environmental regulations and codes 8.2.3 New components are installed and operate per manufacturer instruction and specification 8.2.4 Modifications to system operating parameters or components (including software) are made as required by manufacturer instructions and specifications 8.2.5 Overhaul log is complete, accurate, and on file 8.2.6 Site log is current and up to date	Ability to read schematics, blueprints, etc Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Power delivery Catalysts Project management concepts/terminology Mechanical systems Motor control circuits Programmable logic controllers FC electrical and safety codes & standard Electronics Application specific safety procedures Electrical backup systems Control systems design Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Rigging equipment Safety equipment Personal protective equipment Personal technical library Unit controller software Office computer application software Pressure meters Conductivity testing equipment Turbidity testing equipment Refractometer Multimeter Tubing bender Cell phone

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **8. Perform major overhauls of fuel cells**		**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**
8.3 Conduct pre-start verification	8.3.1 Shipped items are verified and installed per manufacturer instruction 8.3.2 Power plant interfaces are properly connected to electrical power distribution units 8.3.3 Fluid levels are at manufacturer-specified levels 8.3.4 Documented safety procedures are followed 8.3.5 Customer has been trained per manufacturer specifications on modifications relevant to the overhaul, including site-specific safety training 8.3.6 Site log is current and up to date 8.3.7 Pre-start checklist is completed per company policy	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Project management concepts/terminology Mechanical systems Motor control circuits Programmable logic controllers FC electrical and safety codes & standards Electronics Grid interconnectivity Application specific safety procedures Electrical backup systems Control systems design Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Unit controller software Multimeter Personal protective equipment Power and hand tools Voltage meter Cell phone Personal technical library Office computer application software Pressure meters Conductivity testing equipment Amp meter Safety equipment

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **8. Perform major overhauls of fuel cells**		**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**
8.4 Perform functional tests	8.4.1 Unit is started up according to manufacturer instructions 8.4.2 Remote data communication is operational 8.4.3 Documented safety procedures are followed 8.4.4 Service calls are processed and documented as required by company policy 8.4.5 All systems function per manufacturer design 8.4.6 Site log is current and up to date	Ability to read schematics, blueprints, etc Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Project management concepts/terminology Mechanical systems Motor control circuits Programmable logic controllers FC electrical and safety codes & standard Electronics Grid interconnectivity Application specific safety procedures Electrical backup systems Control systems design Basic power system coordination Distribution systems Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Unit controller software Personal protective equipment Pressure meters Multimeter Safety equipment Personal technical library Office computer application software Power and hand tools Voltage meter Amp meter Multifunction test sets RF wattmeter

Fuel Cell Systems Technician Skill Standards

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 8: Perform major overhauls of fuel cells

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: Fuel Cell Systems Technician																
CWF 8. Perform major overhauls of fuel cells																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Info	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adapt-ability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Math	Science
3	3	3	3	4	4	4	3	3	3	3	3	3	3	3	3	3

Statement of Assessment for Critical Work Function 8: Perform major overhauls of fuel cells

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.

Fuel Cell Systems Technician Skill Standards

Back to Summary Table

Critical Work Function **9. Decommission fuel cell**		**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**
9.1 Shut system down for decommissioning	9.1.1 System is powered down per manufacturer's instructions 9.1.2 Proper lock out- tag out procedures are followed 9.1.3 Local utilities are contacted as required by connection agreement 9.1.4 Site log is current and up-to-date	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Mechanical systems Motor control circuits FC electrical and safety codes & standards Electronics Application specific safety procedures Electrical backup systems Control systems design Basic power system coordination Circuit interrupting systems Product knowledge Quality control Computer literacy Testing and measuring procedures Safety training	Power and hand tools Unit controller software Safety equipment Personal protective equipment Cell phone Personal technical library Office computer application software Multimeter

Fuel Cell Systems Technician Skill Standards

			Back to Summary Table
Critical Work Function **9. Decommission fuel cell**		**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**
9.2 Dismantle and remove unit	9.2.1 Appropriate electrical and plumbing connections are disconnected 9.2.2 Appropriate rigging and lifting procedures are followed to transport the system from the site 9.2.3 Equipment is transported to an appropriate disposal site 9.2.4 Disposal log is updated as required 9.2.5 Cradle-to-grave documentation for hazardous material is complete as required by all applicable environmental regulations and codes 9.2.6 Work is performed in accordance with OSHA and site safety codes and practices	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Three-phase power theory Single- and polyphase power distribution Instrumentation basics Project management concepts/terminology Motor control circuits FC electrical and safety codes & standards Application specific safety procedures Control systems design Basic power system coordination Circuit interrupting systems Product knowledge Quality control Testing and measuring procedures Safety training	Power and hand tools Safety equipment Personal protective equipment Rigging equipment Personal technical library
9.3 Perform site restoration	9.3.1 Site is clean and free of debris 9.3.2 Site log is archived as required by company policy 9.3.3 Final site condition is documented with photographs or according to company policy	Ability to read schematics, blueprints, etc. Electrical systems, symbols, and terminology Project management concepts/terminology Application specific safety procedures Product knowledge Quality control Testing and measuring procedures Safety training	Power and hand tools Safety equipment Personal protective equipment Personal technical library

Fuel Cell Systems Technician Skill Standards

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 9: Decommission fuel cells

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: Fuel Cell Systems Technician																
CWF 9. Decommission fuel cells																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Info	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adapt-ability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Math	Science
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2

Statement of Assessment for Critical Work Function 9: Decommission fuel cells

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