

ENERGY AND WATER SECTOR EDUCATION AND TRAINING AUTHORITY

Hydrogen Fuel Cell System Technician

OVERVIEW

The rationale to develop this Skills Program emanates from the Just Energy Transition and the current energy crisis that warrants the increase use of renewable energy. The EWSETA has developed the curriculum for the Hydrogen Fuel Cell System Technician Skills Programme has registration at the QCTO.

Development Process

The SETA convened meetings with a Community of Expert Practitioners which comprised of Industry stakeholders, Higher Education Institutions, Industry Partners, Labour, South Africa's Council for Scientific and Industrial Research

Skills Program

Hydrogen Fuel Cell System Technician NQF level 5 Credits 39



CONTENT FOR DISCUSSION

- What are skills programs
- Unpacking the hydrogen fuel cell system technician skills program
- How to achieve accreditation
- Questions or recommendations
- Workplace experience



SKILLS PROGRAMMES

What are skills programs

- Skills Programmes are occupationally directed.
- They focus on practical, simulation and/or work experience.
- The objective is for certified learners to be more likely to secure employment or be more employable.
- These Skills Programmes can be provided at entry, intermediate, or advanced levels.



UNPACKING THE SKILLS PROGRAM

Purpose

To develop the first-generation cohort of Hydrogen Fuel Cell System Technicians in South Africa.

The participants will be able to:

- Prepare to install hydrogen fuel cell system
- Install hydrogen fuel cell system
- Operate the hydrogen fuel cell system
- Maintain the hydrogen fuel cell system

Entry Requirements

NQF Level 4, with electrical or chemical competencies



Knowledge/Theory Component

- Health and safety regarding hydrogen fuel cell systems,
- Global Energy, CO2 trends, and sustainable fuel alternatives,
- Basics of electricity,
- Hydrogen fuel cell system technology,
- Installation, operation and maintenance of hydrogen fuel cell systems,

Total number of credits for Knowledge Modules: 18



Knowledge/Theory Component - Extract

4.2.1. KM-04-KT01: Hydrogen fuel cell systems (70%)

Topic elements to be covered include:

- KT0101 Types of a hydrogen fuel cell systems [proton-exchange membrane or polymer-electrolyte membrane (PEM) fuel cell; alkaline fuel cells; phosphoric acid fuel cells (PAFC); Direct methanol fuel cells (DMFC)]
- KT0102 Single unit of fuel cell and fuel cell stack
- KT0103 Composition of a hydrogen fuel cell systems
- KT0104 Operation of a hydrogen fuel cell systems
- KT0105 Benefits/advantages of hydrogen fuel cell systems
- KT0106 Process flow of a hydrogen fuel cell system (starting from methanol water blend to finally obtain the end product of usable power)
- KT0107 Hydrogen-based economy



Knowledge/Theory Component - Extract

Internal Assessment Criteria and Weight

- IAC0101 Explain the purpose of a hydrogen fuel cell
- IAC0102 Describe the types of hydrogen fuel cell systems and identify their similarities and differences
- IAC0103 Explain the different operations of hydrogen fuel cell systems
- IAC0104 Discuss, briefly, the single unit of fuel cell and a fuel cell stack and explain how many single units are combined to give a complete stack
- IAC0105 Describe the composition of a hydrogen fuel cell and state the functions and operations of each component
- IAC0106 Explain the basic electrochemical reactions happening inside a single PEM fuel cell unit
- IAC0107 Describe the advantages/benefits of hydrogen fuel cell systems
- IAC0108 Identify the manufacturers of these systems
- IAC0109 Explain the process flow of a hydrogen fuel cell system
- IAC0110 Explain what is meant by future hydrogen-based economy
- IAC0111 Discuss the advantages of hydrogen and of using hydrogen as a source of energy
- IAC0112 Explain how fuel cells play a vital role in bridging the gap between renewable energy and energy consumption



Practical Component

- Perform basic first aid and fire-fighting,
- Conduct 240V single phase electrical wiring activities on panels,
- Conduct site inspection and plan the deployment of a hydrogen fuel cell system,
- Install, operate and monitor a hydrogen fuel cell system,
- Maintain a hydrogen fuel cell systems,

Total number of credits for Application Skill Modules: 14



Practical Component - Extract

4.2 Guidelines for Practical Skills

4.2.1. AM-04-PS01: Install a hydrogen fuel cell system

Scope of Practical Skill

Given different hydrogen fuel cell systems deployment plan, requirements, standards, and regulations relevant to hydrogen fuel cells, safety requirements, the learner must be able to:

- PA0101 Prepare for hydrogen fuel cell system installation
- PA0102 Ensure that all components are available on site
- PA0103 Perform any hardware inspections and tests to ensure that all components are fullyoperational prior to installation
- PA0104 Perform all electrical and physical connections using appropriate equipment
- PA0105 Test the installation for operationality using the customer's load
- PA0106 Attend to any problems or deviations arising from the test
- PA0106 Conduct all activities safely and according to industry protocols



Practical Component - Extract

Applied Knowledge

- AK0101 Types and components of hydrogen fuel cell systems
- AK0102 Installation procedures for these hydrogen fuel cell systems
- AK0103 Equipment to install hydrogen fuel cell system
- AK0104 Requirements, standards, and regulations pertaining to the installation of hydrogen fuel cell systems
- AK0105 Testing procedures for newly-installed hydrogen fuel cell systems
- AK0106 Safety procedures for hydrogen fuel cell system installations



Practical Component - Extract

Internal Assessment Criteria

- IAC0101 All preparation activities and checks to install hydrogen fuel cell system are performed according to industry standards
- IAC0102 Hydrogen fuel cell system is installed using appropriate equipment and industry procedures
- IAC0102 Requirements, standards, and regulations pertaining to the installation of a hydrogen fuel cell system are considered and applied
- IAC0103 Safety procedures and standards are adhered to



Workplace Component

- Processes to conduct site inspection and plan the deployment of a hydrogen fuel cell system
- Processes to install, operate and monitor a hydrogen fuel cell system,
- Processes to maintain a hydrogen fuel cell systems

Total number of credits for Workplace Experience Modules: 7



Workplace Component

1.2 Guidelines for Work Experiences

1.2.1. WM-01-WE01: Conduct site inspection and plan the deployment of a hydrogen fuel cell system under the supervision of a qualified or experienced hydrogen fuel cell system practitioner

Scope of Work Experience

The person will be expected to engage in the following work activities:

- WA0101 Conduct all the checks that are part of site inspection (ground conditions, inclination, hazardous
 material or conditions on site, sufficient space for delivery of equipment to site)
- WA0102 Analyse weather conditions (too windy, too hot etc.)
- WA0103 Apply the requirements, standards, and regulations pertaining to the location and installation of a hydrogen fuel cell system
- WA0104 Identify the appropriate type of transport that will be required for delivery of the system
- WA0105 Plan how and where the hydrogen fuel cell system will be located and determine the type of hydrogen fuel cell system that will be most suitable for installation
- WA0106 Identify and mitigate any potential risks that will impact on the installation and make recommendations to enhance safe and efficient installation



EXIT LEVEL OUTCOMES AND ASSOCIATED ASSESSMENT CRITERIA

- Prepare to install hydrogen fuel cell system
- Install hydrogen fuel cell system
- Conduct post hydrogen fuel cell system installation activities

The Final Supervised Assessment consist of

- written, and
- practical component

Recognition of Prior Learning for persons with experience There is scope to adapt the Skills Program to a Full qualification in the future



4.3 Provider Programme Accreditation Criteria

Physical Requirements:

- Providers must have a training facility with all the resources to deliver the learning as set out in this document. Resources must include training manuals approved by the QCTO, which cover the full spectrum of practical activities in this module, and other relevant documentation.
- Providers must also have access to worksites where these activities are being carried out. Worksites must meet industry requirements.
- Providers must also have all the components that comprise a hydrogen fuel cell system and the equipment required to perform the activities described in this module.
- Adequate area to accommodate the number of learners, as prescribed by the OHS Act.
- Adequate area or space or site to carry out the practical skills
- Access to internet, computers, library and/or e-learning facilities

Human Resource Requirements:

- Facilitators/lecturers must have acquired a suitable degree or tertiary qualification in the electrical, electronic, automation or chemical engineering fields.
- Facilitators/lecturers must have experience with the installation of hydrogen fuel cell systems
- Facilitators/lecturers must have experience in assessment and moderation in one of the engineering fields stated above.

Legal Requirements:

- Compliance to Safety Health Environmental Risk and Quality (SHERQ)
- Compliance to OHS Act and relevant labour legislation laws



HOW TO ACHIEVE ACCREDITATION

THE ROAD TO SUCCESS: THE SKILLS DEVELOPMENT PROVIDER'S GUIDE TO OFFERING OCCUPATIONAL QUALIFICATIONS





https://www.qcto.org.za/assets/qcto_the-road-to-success.pdf



- On line application
- Desktop evaluation
- Site verification



The timeframe for accreditation applications is 90 working days starting from when the upload of all the required supporting documents is complete and this has been confirmed by the QCTO.



Your accreditation is valid for 5 years. Before you reach the end of your accreditation cycle, you will need to follow the same process to re-apply for accreditation.





Consolidated Accreditation Criteria Checklist

Inst	itutional Compliance
1.	CIPC registration documents or proof of establishment (PTY, CC, NGO, NPO, Public Institution)
2.	Your latest Tax Compliance Status (TCS) – State entities like government school, departments, universities, TVET,
	and CET colleges are exempted from the above tax compliance requirement
3.	Proof of financial stability
4.	A valid Occupational Health and Safety (OHS) audit report issued by an authorised person
5.	Proof of premises
6.	Signed Workplace MoU or QCTO Affidavit
7.	Curriculum Vitae (CV) of Facilitators/Assessors and certified copies of ID and Qualification certificates (plus work
	permits for all foreign personnel)
8.	Signed Employment Contracts or SLAs for each Facilitator including the job description/responsibilities of the
	facilitator in relation to the SDP





Consolidated Accreditation Criteria Checklist

Programme Delivery Readiness		
9.	Annexure E (Form 1): Implementation Plan/ Programme Delivery Strategy	
10.	Annexure G (Form 2): Learning Material Matrix	
11.	Annexure H (Form 3): Learning Matters	
12.	Annexure J (Form 4): Signed Declaration	
13.	Learning material for all modules that is aligned to the Curriculum document requirements	
14.	Sufficient, qualified staff for all modules as per the requirements in the Curriculum document	
15.	Checklist of resources/Training Inventory for the knowledge component	
16.	Checklist of resources/Training Inventory for the practical component	
17.	Equipment required for the Trade as per the NAMB checklist (Trade qualifications only)	
18.	Classrooms/venues with basic amenities such as chairs, tables, chalkboard or whiteboard, sufficient lighting,	
4	and ventilation for face-to-face delivery	
19.	Facilities where the simulation or practical training for the qualification will be conducted	
20.	A learner placement strategy for the workplace component as well as a logbook aligned to the Curriculum document	
21.	Career pathway mapped and defined to learners (e.g. career pathway map or diagram for the occupational qualification; vertical and horizontal articulation)	
22.	Learner support services, before, during, and after the training intervention	
23.	Learner Management Information System (LMIS) that will support Confidentiality and the Protection of Personal Information Act (PoPIA) and includes systems for back-ups and access control (security)	





Consolidated Accreditation Criteria Checklist

Management of the Institution

24.	Organogram of the institution	
25.	Policies to govern the management of the institution including:	
	Governance and Finance	
	Human Resources	
	Training (Teaching and Learning)	
	Assessment	
	Certification	
	Appeals	
	Occupational Health and Safety	
	COVID 19 Policy	
	Refund Policy	



WORKPLACE EXPERIENCE

Central to the occupational qualifications is the need for learners to spend time getting workplace experience. Industry exposure for learners is critical. During accreditation, you either had to provide signed MoUs with workplaces or an Affidavit. If you submitted an Affidavit, you must ensure that you have signed MoUs in place with appropriate workplaces before you begin to roll out the programme.

- Learner placements need to be arranged in advance so that there is enough time to get MoUs signed before the programme starts.
- If you have learners in more than one workplace, it helps to have a guide for the workplace to make sure that the standard is the same across the workplaces.



- A facilitator should check in with the learners regularly to provide support if necessary.
- Build relationships with employers having good communication with employers allows you to plan your implementation in line with their production needs so that learners get experience relevant to what they are learning at the time.
- Having a contact person who can liaise with the workplaces and provide them with support is also very useful.



QUESTIONS OR RECOMMENDATIONS



CONTACT DETAILS OF EWSETA

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The EWSETA welcomes any individuals/institutions who would like to make a contribution to the development of qualifications and skills programmes.

The EWSETA encouraged industry partners to bring forward motivations for the development of qualifications and skills programmes needed by the sector.





Thank You