Qualification Pack

Green Hydrogen Refuelling Hub Operator

QP Code: LSC/Q3903

Version: 1.0

NSQF Level: 3

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LSC/Q3903: Green Hydrogen Refuelling Hub Operator

Brief Job Description

The Green Hydrogen Refuelling Hub Operator fills vehicles and vessels with liquid and gaseous hydrogen. The individual in this role is responsible for operating the storage and dispensing equipment with safety and ensuring customer assistance at the refuelling hub. The individual will also maintain records, generate reports, and ensure regulatory compliance for optimal hub performance.

Personal Attributes

The individual must assume full responsibility for this role's hydrogen refuelling hub operation. Key attributes include a keen attention to detail, a systematic approach, a problem-solving attitude, basic communication skills, good personal hygiene, physical fitness, and adaptability to various working environments.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. LSC/N3908: Assist Customers with Green Hydrogen Refuelling
2. LSC/N3909: Operate Liquid Hydrogen Refuelling Equipment
3. LSC/N3910: Handle Hydrogen Storage and Distribution
4. LSC/N3911: Adhere to Safety and Emergency Guidelines for Handling Green Hydrogen
5. DGT/VSQ/N0101: Employability Skills (30 Hours)

Qualification Pack (QP) Parameters

Sector	Logistics
Sub-Sector	Liquid Logistics, Port Terminals, ICD and CFS, Land Transportation
Occupation	Green Hydrogen Operations/ Handling, Hub Operations
Country	India
NSQF Level	3
Credits	13

Qualification Pack

Aligned to NCO/ISCO/ISIC Code	NCO-2015/3134, 3151, 8131, 8182
Minimum Educational Qualification & Experience	10th grade pass (or equivalent) with 1 Year of experience (1.5 Years of relevant experience in handling DG/ Chemicals) OR 9th grade pass with 3 Years of experience in handling DG/ Chemicals OR 8th grade pass with 4 Years of experience (4.5 Years of relevant experience in handling DG/ Chemicals) OR Previous relevant Qualification of NSQF Level (2) with 3 Years of experience in handling DG/ Chemicals
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	19 Years
Last Reviewed On	NA
Next Review Date	30/04/2027
NSQC Approval Date	30/04/2024
Version	1.0
Reference code on NQR	QG-03-TW-02473-2024-V1-LSC
NQR Version	1.0

LSC/N3908: Assist Customers with Green Hydrogen Refuelling

Description

This unit encompasses the knowledge, understanding, and skills needed to run a green hydrogen refuelling hub.

Scope

The scope covers the following :

- Customer Service and Refuelling Assistance
- Inventory Control at Refuelling Hub
- Maintain Hub Facilities
- Payment Collection

Elements and Performance Criteria

Customer Service and Refuelling Assistance

To be competent, the user/individual on the job must be able to:

PC1. greet and interact with customers in a friendly and professional manner

PC2. provide clear and accurate information about hydrogen fuel cell technology, refuelling procedures, and hub facilities

PC3. assist customers in safely operating the refuelling equipment and completing their refuelling transactions

PC4. explain pricing and payment options clearly and efficiently, answer customer inquiries, and resolve basic issues

PC5. maintain accurate records of customer interactions and transactions

PC6. restrict access to sensitive areas like storage tanks and dispensing areas to authorised personnel only

Inventory Control at Refuelling Hub

To be competent, the user/individual on the job must be able to:

PC7. track incoming deliveries of hydrogen by weight or pressure to ensure received quantities match invoices and contractual agreements

PC8. regularly monitor the hydrogen levels in storage tanks at specific intervals (e.g., hourly, daily) using automated sensors or manual gauge readings

PC9. assess the inventory of spare parts and consumables regularly

Maintain Hub Facilities

To be competent, the user/individual on the job must be able to:

PC10. conduct regular inspections of hub facilities and equipment for signs of wear and tear, leaks, or potential hazards

PC11. conduct routine cleaning and upkeep of hub facilities, including restrooms, common areas, and outdoor spaces

PC12. perform minor repairs and maintenance tasks on hub facilities, such as fixing broken lighting or replacing damaged signage

PC13. monitor the progress of ongoing repair work and assist technicians with troubleshooting and repair tasks as required

PC14. verify the completion of repairs and ensure equipment is functioning properly before resuming operations

PC15. manage waste disposal and maintain a clean and sanitary environment

Payment Collection

To be competent, the user/individual on the job must be able to:

PC16. handle customer payments for refuelling using appropriate systems

PC17. provide traditional card terminals for chip-and-pin or swipe transactions with credit and debit cards

PC18. display QR codes on dispensers or hub screens for customers to scan and pay using their mobile banking apps

PC19. offer cash payment options for customers who prefer traditional methods

PC20. ensure the collected cash is secured and properly handed over to the concerned authority

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. properties of hydrogen, hydrogen fuel cell technology and refuelling processes

KU2. principles of customer service and communication skills

KU3. pricing and payment systems used at the hub

KU4. UPI and POS machine

KU5. cash collection and handling procedure

KU6. basic record-keeping and documentation practices

KU7. storage and handling requirements for different types of supplies

KU8. importance of efficient inventory management for cost control

KU9. workplace safety regulations and best practices

KU10. electrical and mechanical safety principles for working with hub equipment

KU11. importance of preventive maintenance for equipment longevity and safety

KU12. waste disposal regulations and environmental best practices

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read manuals, work orders, health and safety instructions, etc.

GS2. deliver exceptional customer service with a friendly, professional, and courteous demeanour

GS3. communicate effectively with customers and supervisors, both verbally and in writing

GS4. actively listen to and understand the needs of customers and colleagues

GS5. handle customer complaints and difficult situations professionally

GS6. make informed decisions in response to customer inquiries and operational challenges

GS7. work effectively as part of a team to achieve common goals

GS8. plan and organise daily tasks to ensure efficient completion of work

GS9. use basic numeracy skills for data recording and analysis

GS10. foster positive relationships within the workplace

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Customer Service and Refuelling Assistance	**9**	**18**	**-**	**3**
PC1. greet and interact with customers in a friendly and professional manner	1	2	-	-
PC2. provide clear and accurate information about hydrogen fuel cell technology, refuelling procedures, and hub facilities	1	3	-	-
PC3. assist customers in safely operating the refuelling equipment and completing their refuelling transactions	2	3	-	1
PC4. explain pricing and payment options clearly and efficiently, answer customer inquiries, and resolve basic issues	1	3	-	-
PC5. maintain accurate records of customer interactions and transactions	2	3	-	1
PC6. restrict access to sensitive areas like storage tanks and dispensing areas to authorised personnel only	2	4	-	1
Inventory Control at Refuelling Hub	**5**	**8**	**-**	**2**
PC7. track incoming deliveries of hydrogen by weight or pressure to ensure received quantities match invoices and contractual agreements	2	3	-	1
PC8. regularly monitor the hydrogen levels in storage tanks at specific intervals (e.g., hourly, daily) using automated sensors or manual gauge readings	1	3	-	1
PC9. assess the inventory of spare parts and consumables regularly	2	2	-	-
Maintain Hub Facilities	**9**	**18**	**-**	**3**
PC10. conduct regular inspections of hub facilities and equipment for signs of wear and tear, leaks, or potential hazards	2	3	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. conduct routine cleaning and upkeep of hub facilities, including restrooms, common areas, and outdoor spaces	1	3	-	-
PC12. perform minor repairs and maintenance tasks on hub facilities, such as fixing broken lighting or replacing damaged signage	1	3	-	1
PC13. monitor the progress of ongoing repair work and assist technicians with troubleshooting and repair tasks as required	2	3	-	1
PC14. verify the completion of repairs and ensure equipment is functioning properly before resuming operations	2	3	-	-
PC15. manage waste disposal and maintain a clean and sanitary environment	1	3	-	-
Payment Collection	**7**	**16**	**-**	**2**
PC16. handle customer payments for refuelling using appropriate systems	2	3	-	-
PC17. provide traditional card terminals for chip-and-pin or swipe transactions with credit and debit cards	1	3	-	-
PC18. display QR codes on dispensers or hub screens for customers to scan and pay using their mobile banking apps	2	3	-	-
PC19. offer cash payment options for customers who prefer traditional methods	1	3	-	1
PC20. ensure the collected cash is secured and properly handed over to the concerned authority	1	4	-	1
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	LSC/N3908
NOS Name	Assist Customers with Green Hydrogen Refuelling
Sector	Logistics
Sub-Sector	Port Terminals, ICD and CFS, Liquid Logistics
Occupation	Green Hydrogen Operations/ Handling, Hub Operations
NSQF Level	3
Credits	3
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

LSC/N3909: Operate Liquid Hydrogen Refuelling Equipment

Description

This unit involves conducting pre-start checks and operating the liquid hydrogen refuelling equipment.

Scope

The scope covers the following :

- Pre-Start Checks and System Activation
- Starting Dispensing Process for Vehicles
- Starting Dispensing Process for Ships/Vessels
- Monitoring Equipment Performance
- Stopping Dispensing Process

Elements and Performance Criteria

Pre-Start Checks and System Activation

To be competent, the user/individual on the job must be able to:

PC1. check all piping connections, valves, and hoses for visible leaks or signs of wear and tear, and inspect the nozzle for damage, cracks, or debris that could impede proper fuelling

PC2. ensure that the safety latch functions smoothly

PC3. identify potential malfunctions by following multiple test procedures like visual inspection, pressure test, flow rate test, temperature monitoring, nozzle and hose functionality, communication and control system test and safety system test

PC4. ensure all hub systems are turned on and operational, including hydrogen supply, compressor, cooling system and communication channel

PC5. follow the manufacturer's specific instructions for starting the dispenser unit with a key, PIN code, or any other authentication and activate the pump in the dispenser unit

PC6. observe pressure gauges and flow indicators to verify proper operation and identify any abnormalities

PC7. check the breakaway coupling and Inline breakaway coupling for additional safety

PC8. ensure the nozzle is clean and retracted, ready for connection

PC9. ensure the check valve is functioning correctly to prevent backflow and potential hazards

Starting Dispensing Process for Vehicles

To be competent, the user/individual on the job must be able to:

PC10. identify incompatible vehicles and refuse refuelling

PC11. identify whether the vehicle operates on liquid hydrogen or hydrogen fuel cell and use appropriate refuelling technique

PC12. guide the vehicle in position, and if equipped, activate the automatic vehicle identification system

PC13. ensure the vehicle’s engine and all electrical systems are turned off and parking brakes are engaged

PC14. connect the vehicle to a grounding point to prevent static electricity build-up

PC15. connect the nozzle securely to the vehicle's fuelling port manually or through automated guidance

PC16. initiate a pre-check sequence to test for leaks and confirm proper pressure connection before engaging in fuelling

PC17. safely remove hydrogen from vehicles using defueling nozzle, if needed

PC18. choose appropriate hydrogen dispensing equipment depending upon the vehicle type; slow-fill for light FCEVs and fast-fill for Heavy-duty FCEVs (buses & trucks)

PC19. select the appropriate fuel level or target pressure on the control panel

PC20. activate the fuelling handle or trigger on the control panel to initiate refuelling

PC21. follow optimal protocols for refuelling, such as SAE J2601, ISO 17266 and PRHYDE Project, depending on factors like vehicle type, ships/vessels hub capabilities, and local regulations

Starting Dispensing Process for Ships/Vessels

To be competent, the user/individual on the job must be able to:

PC22. ensure the ship manoeuvres into the designated refuelling zone alongside the bunker barge or onshore hub, deploying mooring lines for stability

PC23. choose a compatible fuelling nozzle for ships and vessels

PC24. establish communication channels between the ship and hub for coordination and authorisation of the refuelling process

PC25. use specialised hoses and connectors designed for high-pressure hydrogen transfer to the ship/vessels

PC26. equalise the pressure in the ship's tanks slowly with the refuelling system to avoid pressure surges

PC27. commence the controlled flow of hydrogen from the hub to the ship's storage tanks, keeping the flow rate in accordance with the ship's capacity and hub capabilities

Monitoring Equipment Performance

To be competent, the user/individual on the job must be able to:

PC28. monitor dispenser and vehicle tank temperatures during fuelling and adjust flow rate if necessary to prevent overheating

PC29. observe real-time data on the control panel, including pressure, flow rates, total dispensed volume, and any system status messages

PC30. monitor pressure gauge fluctuations, abnormal valve behaviour, or excessive condensation build-up that could indicate system issues

PC31. pay attention to any audible or visual alerts on the control panel that may indicate equipment malfunctions

Stopping Dispensing Process

To be competent, the user/individual on the job must be able to:

PC32. remove the nozzle from the fuel receptacle and stop the fuelling process once the desired amount of hydrogen is dispensed or the tank reaches full

PC33. ensure that the residual pressure is released before disconnecting the nozzle

PC34. follow the manufacturer's instructions to properly shut down the dispensing system, including pumps, compressors, and communication channels

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. basic knowledge of Material Safety Data Sheets (MSDS) used for H2 and O2
KU2. three cascades filling system, a two-stage cascade filling system combined with a booster compressor, or a multiple-stage cascade filling system
KU3. working principle of the hydrogen dispenser
KU4. defueling nozzle, breakaway coupling, inline breakaway coupling, check valve, coalescing filter, filters (circular and T type), fuelling nozzles, service nozzle and protection caps
KU5. leak detection systems like gas detectors
KU6. consequences of leaving the refuelling equipment unattended while in operation
KU7. principles of hydrogen fuel cell technology and refuelling operations
KU8. operational procedures and safety protocols for hydrogen dispensing equipment
KU9. emergency response procedures for hydrogen leaks and other incidents
KU10. audit and inspection procedures for hydrogen facilities

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. effectively communicate with customers, team members and stakeholders
GS2. utilise numeracy skills to monitor vital parameters
GS3. efficiently manage time during the shift
GS4. prioritise tasks and respond promptly to deviations or issues
GS5. embrace a learning mind set to stay updated on evolving technologies
GS6. apply basic data recording and documentation practices

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Pre-Start Checks and System Activation	**7**	**14**	**-**	**2**
PC1. check all piping connections, valves, and hoses for visible leaks or signs of wear and tear, and inspect the nozzle for damage, cracks, or debris that could impede proper fuelling	0.5	1	-	-
PC2. ensure that the safety latch functions smoothly	0.5	1	-	-
PC3. identify potential malfunctions by following multiple test procedures like visual inspection, pressure test, flow rate test, temperature monitoring, nozzle and hose functionality, communication and control system test and safety system test	1	2	-	-
PC4. ensure all hub systems are turned on and operational, including hydrogen supply, compressor, cooling system and communication channel	1	2	-	-
PC5. follow the manufacturer's specific instructions for starting the dispenser unit with a key, PIN code, or any other authentication and activate the pump in the dispenser unit	0.5	1	-	-
PC6. observe pressure gauges and flow indicators to verify proper operation and identify any abnormalities	0.5	1	-	-
PC7. check the breakaway coupling and Inline breakaway coupling for additional safety	1	2	-	1
PC8. ensure the nozzle is clean and retracted, ready for connection	1	2	-	-
PC9. ensure the check valve is functioning correctly to prevent backflow and potential hazards	1	2	-	1
Starting Dispensing Process for Vehicles	**12**	**24**	**-**	**3**
PC10. identify incompatible vehicles and refuse refuelling	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. identify whether the vehicle operates on liquid hydrogen or hydrogen fuel cell and use appropriate refuelling technique	1	2	-	1
PC12. guide the vehicle in position, and if equipped, activate the automatic vehicle identification system	1	2	-	1
PC13. ensure the vehicle's engine and all electrical systems are turned off and parking brakes are engaged	1	2	-	-
PC14. connect the vehicle to a grounding point to prevent static electricity build-up	1	2	-	-
PC15. connect the nozzle securely to the vehicle's fuelling port manually or through automated guidance	1	2	-	-
PC16. initiate a pre-check sequence to test for leaks and confirm proper pressure connection before engaging in fuelling	1	2	-	-
PC17. safely remove hydrogen from vehicles using defueling nozzle, if needed	1	2	-	-
PC18. choose appropriate hydrogen dispensing equipment depending upon the vehicle type; slow-fill for light FCEVs and fast-fill for Heavy-duty FCEVs (buses & trucks)	1	2	-	1
PC19. select the appropriate fuel level or target pressure on the control panel	1	2	-	-
PC20. activate the fuelling handle or trigger on the control panel to initiate refuelling	1	2	-	-
PC21. follow optimal protocols for refuelling, such as SAE J2601, ISO 17266 and PRHYDE Project, depending on factors like vehicle type, ships/vessels hub capabilities, and local regulations	1	2	-	-
Starting Dispensing Process for Ships/Vessels	**5**	**12**	**-**	**2**
PC22. ensure the ship manoeuvres into the designated refuelling zone alongside the bunker barge or onshore hub, deploying mooring lines for stability	1	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC23. choose a compatible fuelling nozzle for ships and vessels	0.5	2	-	-
PC24. establish communication channels between the ship and hub for coordination and authorisation of the refuelling process	1	2	-	-
PC25. use specialised hoses and connectors designed for high-pressure hydrogen transfer to the ship/vessels	1	2	-	1
PC26. equalise the pressure in the ship's tanks slowly with the refuelling system to avoid pressure surges	1	2	-	-
PC27. commence the controlled flow of hydrogen from the hub to the ship's storage tanks, keeping the flow rate in accordance with the ship's capacity and hub capabilities	0.5	2	-	-
Monitoring Equipment Performance	**3**	**4**	**-**	**2**
PC28. monitor dispenser and vehicle tank temperatures during fuelling and adjust flow rate if necessary to prevent overheating	1	1	-	1
PC29. observe real-time data on the control panel, including pressure, flow rates, total dispensed volume, and any system status messages	0.5	1	-	-
PC30. monitor pressure gauge fluctuations, abnormal valve behaviour, or excessive condensation build-up that could indicate system issues	1	1	-	1
PC31. pay attention to any audible or visual alerts on the control panel that may indicate equipment malfunctions	0.5	1	-	-
Stopping Dispensing Process	**3**	**6**	**-**	**1**
PC32. remove the nozzle from the fuel receptacle and stop the fuelling process once the desired amount of hydrogen is dispensed or the tank reaches full	1	2	-	-
PC33. ensure that the residual pressure is released before disconnecting the nozzle	1	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC34. follow the manufacturer's instructions to properly shut down the dispensing system, including pumps, compressors, and communication channels	1	2	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	LSC/N3909
NOS Name	Operate Liquid Hydrogen Refuelling Equipment
Sector	Logistics
Sub-Sector	Port Terminals, ICD and CFS, Liquid Logistics
Occupation	Green Hydrogen Operations/ Handling, Hub Operations
NSQF Level	3
Credits	3
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

LSC/N3910: Handle Hydrogen Storage and Distribution

Description

This unit involves monitoring and managing green hydrogen storage at the hub and ensuring safe distribution.

Scope

The scope covers the following :

- Monitor liquid hydrogen storage and distribution
- Ensure safety compliance and maintain logs

Elements and Performance Criteria

Monitor Liquid Hydrogen Storage and Distribution

To be competent, the user/individual on the job must be able to:

PC1. monitor hydrogen storage tank levels and pressure gauges to ensure safe and optimal operation

PC2. conduct regular inspections of storage tanks and associated equipment for leaks, corrosion, and damage

PC3. conduct regular visual inspections of all hydrogen piping, storage tanks and connections for signs of wear, cracking, or corrosion

PC4. follow SOP for filling, emptying, and venting hydrogen storage tanks

PC5. adhere to specific procedures for filling, storing, and transferring gaseous hydrogen in high-pressure tanks and systems

PC6. use approved methods for leak detection, like soapy water solutions or electronic detectors

PC7. replace gaskets, seals, and hoses before they deteriorate, potentially causing leaks

PC8. implement temperature control measures to maintain optimal hydrogen storage conditions

PC9. schedule and adhere to routine maintenance procedures specified by equipment manufacturers

PC10. ensure coalescing Filter, Circular and T-type filters are working properly

PC11. verify compatibility of vehicles or equipment with the hydrogen dispensed at the hub

PC12. verify that distribution equipment meets safety standards

Ensure Safety Compliance and Maintain Logs

To be competent, the user/individual on the job must be able to:

PC13. monitor hydrogen flow rates and pressures during refuelling to ensure safe and efficient delivery

PC14. respond promptly to any deviations or issues during distribution operations

PC15. document hydrogen delivery transactions and equipment performance data accurately and promptly

PC16. ensure compliance with safety certifications and operational standards through proper documentation and reporting

PC17. respond to audits and inspections from regulatory agencies by providing accurate documentation and information

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. physical and chemical properties of hydrogen, including its flammability, exclusivity, and ability to leak through materials
KU2. basic knowledge of Material Safety Data Sheets (MSDS) used for H2 and O2
KU3. hydrogen fuel cell technology and refuelling processes
KU4. principles of hydrogen storage and distribution systems
KU5. hydrogen storage tank operation
KU6. pressure and temperature management, flow control, and safety considerations
KU7. safety regulations and standards related to hydrogen storage
KU8. various tank inspection methods
KU9. operational procedures and safety protocols for hydrogen dispensing equipment
KU10. safety protocols for hydrogen distribution
KU11. potential hazards associated with hydrogen leaks, fires, and explosions
KU12. environmental regulations and best practices for hydrogen transportation
KU13. basic data recording and documentation practices

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. effectively communicate with team members and stakeholders
GS2. foster positive interactions with vehicle operators, equipment users, and team members
GS3. ensure accuracy in the documentation process
GS4. utilise numeracy skills to monitor vital parameters
GS5. efficiently manage time during the shift
GS6. prioritise tasks and respond promptly to deviations or issues
GS7. embrace a learning mindset to stay updated on evolving technologies
GS8. apply basic data recording and documentation practices

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Monitor Liquid Hydrogen Storage and Distribution	**21**	**41**	**-**	**7**
PC1. monitor hydrogen storage tank levels and pressure gauges to ensure safe and optimal operation	1	3	-	-
PC2. conduct regular inspections of storage tanks and associated equipment for leaks, corrosion, and damage	2	4	-	1
PC3. conduct regular visual inspections of all hydrogen piping, storage tanks and connections for signs of wear, cracking, or corrosion	2	3	-	1
PC4. follow SOP for filling, emptying, and venting hydrogen storage tanks	1	3	-	1
PC5. adhere to specific procedures for filling, storing, and transferring gaseous hydrogen in high-pressure tanks and systems	1	3	-	1
PC6. use approved methods for leak detection, like soapy water solutions or electronic detectors	2	4	-1	-
PC7. replace gaskets, seals, and hoses before they deteriorate, potentially causing leaks	2	3	-	-
PC8. implement temperature control measures to maintain optimal hydrogen storage conditions	2	4	-	1
PC9. schedule and adhere to routine maintenance procedures specified by equipment manufacturers	2	3	-	-
PC10. ensure coalescing Filter, Circular and T-type filters are working properly	2	3	-	-
PC11. verify compatibility of vehicles or equipment with the hydrogen dispensed at the hub	2	4	-	1
PC12. verify that distribution equipment meets safety standards	2	4	-	1
Ensure Safety Compliance and Maintain Logs	**9**	**19**	**-**	**3**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. monitor hydrogen flow rates and pressures during refuelling to ensure safe and efficient delivery	2	4	-	-
PC14. respond promptly to any deviations or issues during distribution operations	2	4	-	1
PC15. document hydrogen delivery transactions and equipment performance data accurately and promptly	1	3	-	-
PC16. ensure compliance with safety certifications and operational standards through proper documentation and reporting	2	4	-	1
PC17. respond to audits and inspections from regulatory agencies by providing accurate documentation and information	2	4	-	1
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	LSC/N3910
NOS Name	Handle Hydrogen Storage and Distribution
Sector	Logistics
Sub-Sector	Port Terminals, ICD and CFS, Liquid Logistics
Occupation	Green Hydrogen Operations/ Handling, Hub Operations
NSQF Level	3
Credits	2
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

LSC/N3911: Adhere to Safety and Emergency Guidelines for Handling Green Hydrogen

Description

This unit is about maintaining equipment performance, adhering to regulation standards and responding to emergencies at the green hydrogen refuelling hub.

Scope

The scope covers the following :

- Calibrate and maintain equipment performance
- Compliance with regulations and standards
- Safety procedures
- First Aid
- Emergency response preparedness

Elements and Performance Criteria

Calibrate and Maintain Equipment Performance

To be competent, the user/individual on the job must be able to:

PC1. regularly inspect gauges and indicators for abnormal readings

PC2. calibrate hydrogen dispensing equipment regularly according to SOP and manufacturer specifications

PC3. perform routine maintenance tasks on hub equipment, such as compressor functioning, filter changes and lubrication

PC4. identify and report potential equipment malfunctions or performance issues to maintenance personnel promptly

PC5. maintain accurate records of equipment calibration, maintenance activities, and performance data

Compliance with Regulations and Standards

To be competent, the user/individual on the job must be able to:

PC6. stay informed about the latest regulations related to hydrogen production, storage and refuelling

PC7. keep away any ignition sources from hydrogen storage areas and maintain a strict no-smoking policy within this zone

PC8. ensure hazardous areas and equipment are clearly marked with appropriate signage and warnings

PC9. use specialised Personal Protective Equipment (PPE) for working in a hydrogen environment, such as flame-resistant suits made from non-static material, goggles and face shields to protect against pressure-driven debris, gloves (neoprene or nitrile), safety boots, respirators and hearing protection for noisy areas

PC10. wear appropriate cryogenic protective clothing and gloves when handling liquid hydrogen

PC11. report any non-compliance issues promptly to relevant personnel

PC12. liaise with regulatory authorities during inspections and audits

Safety Procedures

To be competent, the user/individual on the job must be able to:

PC13. adhere to safety protocols when using materials, tools, and equipment

PC14. refer to relevant safety standards and guidelines like IEC 61508, NFPA 2, and industry best practices for identifying hydrogen process hazards

PC15. use various hydrogen flame detection methods at hydrogen refuelling hubs, such as Ultraviolet (UV) Flame Detectors, Infrared (IR) Flame Detectors, Multi-spectrum Detectors, Video Image Flame Detectors (VIFDs), etc.

PC16. use pressure relief valves and automatic shut-off mechanisms to prevent the uncontrolled release of hydrogen

PC17. use oil-free equipment compatible with pure oxygen to avoid combustion risks

PC18. choose electrical equipment rated for Zone 0 or Zone 1 depending on the potential hydrogen concentration and risk of ignition

PC19. utilise intrinsically safe tools and components that eliminate the risk of sparking, such as sealed switches, capacitors, and motors

PC20. implement various control measures, such as pressure relief valves, explosion suppression systems, leak detection systems, interlocks and automated safety systems

PC21. vent hydrogen to a safe, designated area well away from ignition sources, using a dedicated vent stack designed for high-pressure hydrogen release

PC22. dilute oxygen with an inert gas like nitrogen before venting to decrease its concentration and mitigate fire risks

First Aid

To be competent, the user/individual on the job must be able to:

PC23. follow first aid instructions appropriately

PC24. move yourself or the injured person away from the source of the cryogenic liquid or gas to stop further exposure

PC25. rewarm the affected area using lukewarm water (around 38°C or 100°F), in case of cryogenic burns

PC26. raise the affected area above the heart level (if possible) to reduce swelling and pain for of cryogenic burns

PC27. move the injured person to fresh air and loosen any constricting clothing, if the person is exposed to a toxic gas

PC28. perform the Heimlich manoeuvre or chest thrusts as appropriate

PC29. start CPR if the person is not breathing and has no pulse

Emergency Response Preparedness

To be competent, the user/individual on the job must be able to:

PC30. use appropriate fire extinguishers compatible with hydrogen and fire hoses to isolate the fire at the source

PC31. wear appropriate personal protective equipment (PPE) when handling or using extinguishers in a hydrogen environment

PC32. operate emergency shutdown procedures in case of leaks, pressure spikes, or other safety concerns and activate alarms as necessary

PC33. respond promptly and effectively to emergencies and potential hydrogen leaks, including evacuation procedures, communication with emergency services, and implementation of emergency response plans

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. principles of hydrogen production, storage, and dispensing equipment
KU2. safety protocols and regulations governing the operation of hydrogen refuelling hubs
KU3. hydrogen fire
KU4. cryogenic temperatures and high-pressure systems
KU5. cryogenic protective clothing
KU6. common signs of equipment malfunction, leaks, or pressure irregularities
KU7. interpretation of monitoring tools and indicators
KU8. electric equipment in hazardous areas/zones
KU9. PASS technique of using a fire extinguisher
KU10. common safety hazards associated with hydrogen refuelling hubs
KU11. record-keeping requirements for compliance documentation
KU12. emergency shut-off systems and alarms

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. communicate clearly and concisely with colleagues, supervisors, and emergency services
GS2. collaborate effectively with maintenance personnel to diagnose and address equipment issues
GS3. actively listen to and consider feedback from colleagues and supervisors
GS4. make quick and informed decisions during emergencies
GS5. adapt to changing circumstances and unforeseen situations
GS6. remain up-to-date on the latest regulations and standards
GS7. maintain composure and clear thinking under pressure
GS8. evaluate risks and benefits before taking any action
GS9. utilise the principles of time management and organisational skills to prioritise tasks, manage workload, and meet deadlines effectively
GS10. engage in ongoing professional development for enhanced job performance

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Calibrate and Maintain Equipment Performance	**4**	**9**	**-**	**2**
PC1. regularly inspect gauges and indicators for abnormal readings	1	2	-	-
PC2. calibrate hydrogen dispensing equipment regularly according to SOP and manufacturer specifications	1	2	-	1
PC3. perform routine maintenance tasks on hub equipment, such as compressor functioning, filter changes and lubrication	1	2	-	-
PC4. identify and report potential equipment malfunctions or performance issues to maintenance personnel promptly	0.5	2	-	-
PC5. maintain accurate records of equipment calibration, maintenance activities, and performance data	0.5	1	-	1
Compliance with Regulations and Standards	**5.5**	**12**	**-**	**2**
PC6. stay informed about the latest regulations related to hydrogen production, storage and refuelling	0.5	2	-	-
PC7. keep away any ignition sources from hydrogen storage areas and maintain a strict no-smoking policy within this zone	0.5	2	-	-
PC8. ensure hazardous areas and equipment are clearly marked with appropriate signage and warnings	0.5	1	-	-
PC9. use specialised Personal Protective Equipment (PPE) for working in a hydrogen environment, such as flame-resistant suits made from non-static material, goggles and face shields to protect against pressure-driven debris, gloves (neoprene or nitrile), safety boots, respirators and hearing protection for noisy areas	1	2	-	1
PC10. wear appropriate cryogenic protective clothing and gloves when handling liquid hydrogen	1	1	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. report any non-compliance issues promptly to relevant personnel	1	2	-	1
PC12. liaise with regulatory authorities during inspections and audits	1	2	-	-
Safety Procedures	**9.5**	**18**	**-**	**2**
PC13. adhere to safety protocols when using materials, tools, and equipment	1	1	-	-
PC14. refer to relevant safety standards and guidelines like IEC 61508, NFPA 2, and industry best practices for identifying hydrogen process hazards	1	1	-	-
PC15. use various hydrogen flame detection methods at hydrogen refuelling hubs, such as Ultraviolet (UV) Flame Detectors, Infrared (IR) Flame Detectors, Multi-spectrum Detectors, Video Image Flame Detectors (VIFDs), etc.	1	2	-	1
PC16. use pressure relief valves and automatic shut-off mechanisms to prevent the uncontrolled release of hydrogen	1	2	-	-
PC17. use oil-free equipment compatible with pure oxygen to avoid combustion risks	1	3	-	-
PC18. choose electrical equipment rated for Zone 0 or Zone 1 depending on the potential hydrogen concentration and risk of ignition	0.5	1	-	-
PC19. utilise intrinsically safe tools and components that eliminate the risk of sparking, such as sealed switches, capacitors, and motors	1	2	-	-
PC20. implement various control measures, such as pressure relief valves, explosion suppression systems, leak detection systems, interlocks and automated safety systems	1	2	-	-
PC21. vent hydrogen to a safe, designated area well away from ignition sources, using a dedicated vent stack designed for high-pressure hydrogen release	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. dilute oxygen with an inert gas like nitrogen before venting to decrease its concentration and mitigate fire risks	1	2	-	1
First Aid	**7**	**14**	**-**	**2**
PC23. follow first aid instructions appropriately	1	2	-	-
PC24. move yourself or the injured person away from the source of the cryogenic liquid or gas to stop further exposure	1	2	-	-
PC25. rewarm the affected area using lukewarm water (around 38°C or 100°F), in case of cryogenic burns	1	2	-	-
PC26. raise the affected area above the heart level (if possible) to reduce swelling and pain for of cryogenic burns	1	2	-	1
PC27. move the injured person to fresh air and loosen any constricting clothing, if the person is exposed to a toxic gas	1	2	-	-
PC28. perform the Heimlich manoeuvre or chest thrusts as appropriate	1	2	-	1
PC29. start CPR if the person is not breathing and has no pulse	1	2	-	-
Emergency Response Preparedness	**4**	**7**	**-**	**2**
PC30. use appropriate fire extinguishers compatible with hydrogen and fire hoses to isolate the fire at the source	1	2	-	1
PC31. wear appropriate personal protective equipment (PPE) when handling or using extinguishers in a hydrogen environment	1	2	-	-
PC32. operate emergency shutdown procedures in case of leaks, pressure spikes, or other safety concerns and activate alarms as necessary	1	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC33. respond promptly and effectively to emergencies and potential hydrogen leaks, including evacuation procedures, communication with emergency services, and implementation of emergency response plans	1	1	-	-
NOS Total	**30**	**60**	**-**	**10**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	LSC/N3911
NOS Name	Adhere to Safety and Emergency Guidelines for Handling Green Hydrogen
Sector	Logistics
Sub-Sector	Port Terminals, ICD and CFS, Liquid Logistics
Occupation	Green Hydrogen Operations/ Handling, Hub Operations
NSQF Level	3
Credits	3
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

DGT/VSQ/N0101: Employability Skills (30 Hours)

Description

This unit is about employability skills, Constitutional values, becoming a professional in the 21st Century, digital, financial, and legal literacy, diversity and Inclusion, English and communication skills, customer service, entrepreneurship, and apprenticeship, getting ready for jobs and career development.

Scope

The scope covers the following :

- Introduction to Employability Skills
- Constitutional values - Citizenship
- Becoming a Professional in the 21st Century
- Basic English Skills
- Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy
- Essential Digital Skills
- Entrepreneurship
- Customer Service
- Getting ready for Apprenticeship & Jobs

Elements and Performance Criteria

Introduction to Employability Skills

To be competent, the user/individual on the job must be able to:

PC1. understand the significance of employability skills in meeting the job requirements

Constitutional values – Citizenship

To be competent, the user/individual on the job must be able to:

PC2. identify constitutional values, civic rights, duties, personal values and ethics and environmentally sustainable practices

Becoming a Professional in the 21st Century

To be competent, the user/individual on the job must be able to:

PC3. explain 21st Century Skills such as Self-Awareness, Behavior Skills, Positive attitude, self-motivation, problem-solving, creative thinking, time management, social and cultural awareness, emotional awareness, continuous learning mindset etc.

Basic English Skills

To be competent, the user/individual on the job must be able to:

PC4. speak with others using some basic English phrases or sentences

Communication Skills

To be competent, the user/individual on the job must be able to:

PC5. follow good manners while communicating with others

PC6. work with others in a team

Diversity & Inclusion

To be competent, the user/individual on the job must be able to:

PC7. communicate and behave appropriately with all genders and PwD

PC8. report any issues related to sexual harassment

Financial and Legal Literacy

To be competent, the user/individual on the job must be able to:

PC9. use various financial products and services safely and securely

PC10. calculate income, expenses, savings etc.

PC11. approach the concerned authorities for any exploitation as per legal rights and laws

Essential Digital Skills

To be competent, the user/individual on the job must be able to:

PC12. operate digital devices and use its features and applications securely and safely

PC13. use internet and social media platforms securely and safely

Entrepreneurship

To be competent, the user/individual on the job must be able to:

PC14. identify and assess opportunities for potential business

PC15. identify sources for arranging money and associated financial and legal challenges

Customer Service

To be competent, the user/individual on the job must be able to:

PC16. identify different types of customers

PC17. identify customer needs and address them appropriately

PC18. follow appropriate hygiene and grooming standards

Getting ready for apprenticeship & Jobs

To be competent, the user/individual on the job must be able to:

PC19. create a basic biodata

PC20. search for suitable jobs and apply

PC21. identify and register apprenticeship opportunities as per requirement

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. need for employability skills

KU2. various constitutional and personal values

KU3. different environmentally sustainable practices and their importance

KU4. Twenty first (21st) century skills and their importance

KU5. how to use basic spoken English language

KU6. Do and dont of effective communication

KU7. inclusivity and its importance

KU8. different types of disabilities and appropriate communication and behaviour towards PwD

KU9. different types of financial products and services

KU10. how to compute income and expenses
KU11. importance of maintaining safety and security in financial transactions
KU12. different legal rights and laws
KU13. how to operate digital devices and applications safely and securely
KU14. ways to identify business opportunities
KU15. types of customers and their needs
KU16. how to apply for a job and prepare for an interview
KU17. apprenticeship scheme and the process of registering on apprenticeship portal

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. communicate effectively using appropriate language
GS2. behave politely and appropriately with all
GS3. perform basic calculations
GS4. solve problems effectively
GS5. be careful and attentive at work
GS6. use time effectively
GS7. maintain hygiene and sanitisation to avoid infection

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction to Employability Skills	**1**	**1**	**-**	**-**
PC1. understand the significance of employability skills in meeting the job requirements	-	-	-	-
Constitutional values – Citizenship	**1**	**1**	**-**	**-**
PC2. identify constitutional values, civic rights, duties, personal values and ethics and environmentally sustainable practices	-	-	-	-
Becoming a Professional in the 21st Century	**1**	**3**	**-**	**-**
PC3. explain 21st Century Skills such as Self-Awareness, Behavior Skills, Positive attitude, self-motivation, problem-solving, creative thinking, time management, social and cultural awareness, emotional awareness, continuous learning mindset etc.	-	-	-	-
Basic English Skills	**2**	**3**	**-**	**-**
PC4. speak with others using some basic English phrases or sentences	-	-	-	-
Communication Skills	**1**	**1**	**-**	**-**
PC5. follow good manners while communicating with others	-	-	-	-
PC6. work with others in a team	-	-	-	-
Diversity & Inclusion	**1**	**1**	**-**	**-**
PC7. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC8. report any issues related to sexual harassment	-	-	-	-
Financial and Legal Literacy	**3**	**4**	**-**	**-**
PC9. use various financial products and services safely and securely	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. calculate income, expenses, savings etc.	-	-	-	-
PC11. approach the concerned authorities for any exploitation as per legal rights and laws	-	-	-	-
Essential Digital Skills	**4**	**6**	**-**	**-**
PC12. operate digital devices and use its features and applications securely and safely	-	-	-	-
PC13. use internet and social media platforms securely and safely	-	-	-	-
Entrepreneurship	**3**	**5**	**-**	**-**
PC14. identify and assess opportunities for potential business	-	-	-	-
PC15. identify sources for arranging money and associated financial and legal challenges	-	-	-	-
Customer Service	**2**	**2**	**-**	**-**
PC16. identify different types of customers	-	-	-	-
PC17. identify customer needs and address them appropriately	-	-	-	-
PC18. follow appropriate hygiene and grooming standards	-	-	-	-
Getting ready for apprenticeship & Jobs	**1**	**3**	**-**	**-**
PC19. create a basic biodata	-	-	-	-
PC20. search for suitable jobs and apply	-	-	-	-
PC21. identify and register apprenticeship opportunities as per requirement	-	-	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0101
NOS Name	Employability Skills (30 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	2
Credits	1
Version	1.0
Last Reviewed Date	30/04/2024
Next Review Date	30/04/2027
NSQC Clearance Date	30/04/2024

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC

2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC

3. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below)

4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criterion

5. To pass the Qualification Pack, every trainee should score a minimum of 70% for NSQF level 4 & above job roles and 50% for NSQF level 1 to 3 job roles

6. In case of unsuccessful completion, the trainee may seek re-assessment on the Qualification Pack

Minimum Aggregate Passing % at QP Level : 50

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Minimum Passing % at NOS Level: 50

(**Please note**: A Trainee must score the minimum percentage for each NOS separately as well as on the QP as a whole.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
LSC/N3908.Assist Customers with Green Hydrogen Refuelling	30	60	-	10	100	20
LSC/N3909.Operate Liquid Hydrogen Refuelling Equipment	30	60	-	10	100	25
LSC/N3910.Handle Hydrogen Storage and Distribution	30	60	-	10	100	25
LSC/N3911.Adhere to Safety and Emergency Guidelines for Handling Green Hydrogen	30	60	-	10	100	20
DGT/VSQ/N0101.Employability Skills (30 Hours)	20	30	-	-	50	10
Total	**140**	**270**	**-**	**40**	**450**	**100**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.