



Model Curriculum

QP Name: Green Hydrogen Refuelling Hub Operator

QP Code: LSC/Q3903

QP Version: 1.0

NSQF Level: 3

Model Curriculum Version: 1.0

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Training 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 |
| Aligned to NCO/ISCO/ISIC Code | NCO-2015/3151 |
| Minimum Educational Qualification and 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 |
| Pre-Requisite License or Training | NA |
| Minimum Job Entry Age | 19 |
| Last Reviewed On | 30-04-2024 |
| Next Review Date | 30-04-2027 |
| NSQC Approval Date | 30-04-2024 |
| QP Version | 1.0 |
| Model Curriculum Creation Date | 15-03-2024 |
| Model Curriculum Valid Up to Date | 30-04-2027 |
| Model Curriculum Version | 1.0 |
| Minimum Duration of the Course | 390 |
| Maximum Duration of the Course | 390 |

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner will be able to:

Compulsory Modules

The table lists the modules, their duration and mode of delivery.

| NOS and Module Details | Theory Duration | Practical Duration | On-the-Job Training Duration (Mandatory) | On-the-Job Training Duration (Recommended) | Total Duration |
|--|-----------------|--------------------|--|--|----------------|
| Bridge Module | 20 | 10 | | | 30 |
| Module 1: Introduction to Green Hydrogen Refueling Hub Operator | 20 | 10 | | | 30 |
| LSC/N3908 - Assist Customers with Green Hydrogen refueling V1.0 NSQF Level 3 | 20 | 60 | 10 | | 90 |
| Module 2: Refueling assistance and hub operations | 20 | 60 | 10 | | 90 |
| LSC/N3909 - Operate Liquid Hydrogen refueling Equipment V1.0 NSQF Level 3 | 20 | 60 | 10 | | 90 |
| Module 3: Liquid Hydrogen fuel dispensing. | 20 | 60 | 10 | | 90 |
| LSC/N3910 - Handle Hydrogen Storage and Distribution V1.0 NSQF Level 3 | 20 | 40 | | | 60 |
| Module 4: Handling Green Hydrogen Storage and Distribution | 20 | 40 | | | 60 |
| LSC/N3911 - Adhere to Safety and Emergency Guidelines for Handling Green Hydrogen V1.0 NSQF Level 3 | 20 | 60 | 10 | | 90 |

| | | | | | |
|--|------------|------------|-----------|--|------------|
| Module 5: Safety and Emergency Guidelines for Handling Green Hydrogen | 20 | 60 | 10 | | 90 |
| Employability Skills DGT/VSQ/N0101 | 15 | 15 | | | 30 |
| Total Duration | 115 | 245 | 30 | | 390 |

Module Details

Module 1: Introduction to Green Hydrogen Refuelling Hub Operator

Mapped to Bridge Module

Terminal Outcomes:

- Describe the Basics of Green Hydrogen
- Brief the applications of green hydrogen in industry, transport and power production.

| Duration: 20:00 | Duration: 10:00 |
|---|--|
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> • Describe the properties and characteristics of Hydrogen • Discuss various colour code nomenclature of Hydrogen • Elaborate the role of Green Hydrogen in sustainable energy transition. • Discuss key aspects related to production, storage and transportation of Green Hydrogen • Brief the applications of green hydrogen in industry, transport and power production. | <ul style="list-style-type: none"> • Demonstrate with chart colour code nomenclature of Hydrogen. • Perform an activity to match the process and source of production of different colour codes of hydrogen. • Draw a flow diagram of the green hydrogen value chain. • List down the potential end uses of GH2 across the energy system. • Illustrate the role and responsibilities of the Green Hydrogen Refuelling Hub Operator. |
| Classroom Aids | |
| Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser | |
| Tools, Equipment and Other Requirements | |
| Green Hydrogen colour charts, LLMS(learning version) | |

Module 2: Refuelling assistance and refuelling hub operations

Mapped to LSC/N3908, v1.0

Terminal Outcomes:

- Demonstrate the steps for providing refuelling assistance to customers.
- Describe the process of maintaining inventory control at the Refuelling Hub.
- Explain the importance of maintaining and upkeeping the hub facilities.
- Discuss the billing and payment collection process.

| Duration: 20:00 | Duration: 60:00 |
|--|--|
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> • Detail the steps involved in providing refuelling assistance to customers. • Describe the process of maintaining inventory control at the Refuelling Hub. • Explain the importance of maintaining and upkeeping the hub facilities. • Discuss the billing and payment collection process. | <ul style="list-style-type: none"> • Demonstrate the steps for providing refuelling assistance to customers. • Maintain accurate records of customer interactions and transactions • Perform the steps for monitoring inventory control at the GH2 Refuelling Hub. • Demonstrate the steps involved in maintaining the hub facilities. • Perform billing for retail customers and payment collection. |
| Classroom Aids | |
| Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser | |
| Tools, Equipment and Other Requirements | |
| Safety gear (gloves, safety glasses), Pressure gauges, Basic repair tools (screwdrivers, wrenches, pliers, hammers, and duct tape), First aid kits, Fire extinguishers, Waste disposal bins, Point-of-sale (POS) machines, cleaning supplies, Filters, Seals and gaskets, Regulators, Safety relief valves, Nozzle, Coupling, Hoses, Lubricants. | |

Module 3: Liquid Hydrogen fuel dispensing

Mapped to LSC/N3909, v1.0

Terminal Outcomes:

- Explain the importance of performing pre-start checks.
- Perform the steps involved in the fuel dispensing process for vehicles/ Ships/Vessels.
- Discuss how to monitor dispensing equipment performance.
- Demonstrate stopping the fuel dispensing process.

| Duration: 20:00 | Duration: 60:00 |
|---|--|
| <p>Theory – Key Learning Outcomes</p> <ul style="list-style-type: none"> • Explain the importance of performing pre-start checks. • Describe the fuel dispensing process for vehicles • Detail the fuel dispensing process for Ships/Vessels • Discuss how to monitor dispensing equipment performance. | <p>Practical – Key Learning Outcomes</p> <ul style="list-style-type: none"> • Prepare a checklist with the prestart checks to be done. • Do necessary checks according to the checklist prepared. • Perform the steps involved in the fuel dispensing process for vehicles. • Execute the steps involved in the fuel dispensing process for Ships/Vessels. • Perform the steps to monitor the dispensing equipment performance. • Demonstrate stopping the fuel dispensing process. |
| <p>Classroom Aids</p> <p>Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser</p> | |
| <p>Tools, Equipment and Other Requirements</p> <p>Safety gear (gloves, safety glasses), Hydrogen dispenser unit (optional), Flashlight, Leak detector, videos and charts/ models of - Grounding cable and clamp, Defueling Nozzle, Breakaway Coupling, Inline Breakaway Coupling, Check Valve, Coalescing Filter, Filters (Circular and T type), Fueling Nozzles, Service Nozzle, and Protection Caps, High-pressure connectors, Fire extinguisher</p> | |

Module 4: Handling Green Hydrogen Storage and Distribution

Mapped to LSC/N3910, v1.0

Terminal Outcomes:

- Detail the process for monitoring liquid hydrogen storage.
- List down the regular checks and inspections done at the storage area.
- Perform the steps for compatibility check of vehicles or equipment with the hydrogen dispensed at the hub
- Document and maintain logs related to safety compliance.

| Duration: 20:00 | Duration: 40:00 |
|---|--|
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> • Detail the process for monitoring liquid hydrogen storage. • List down the regular checks and inspections done at the storage area. • Explain the importance of conducting a compatibility check. • Describe the safety compliance to be followed during the refuelling process. • Elaborate the significance of documenting and maintaining logs related to safety compliance. | <ul style="list-style-type: none"> • Demonstrate the steps involved in monitoring liquid hydrogen storage. • Conduct regular inspections of storage tanks and associated equipment. • Perform the steps for compatibility check of vehicles or equipment with the hydrogen dispensed at the hub • Ensure to follow steps involved in Safety Compliance at the hub. • Document and maintain logs related to safety compliance. |
| Classroom Aids | |
| Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser | |
| Tools, Equipment and Other Requirements | |
| Pressure gauges, Leak detector, Soapy water solution, Personal protective equipment (PPE), Coalescing Filter, Circular and T-type filter, Safety data sheets (MSDS), Basic repair tools (screwdrivers, wrenches, pliers, hammers, and duct tape), Fire extinguisher | |

Module 5: Safety and Emergency Guidelines for Handling Green Hydrogen

Mapped to LSC/N3911, v1.0

Terminal Outcomes:

- Perform the steps for calibrating the performance of equipment.
- Detail the steps involved in maintaining the equipment performance.
- Illustrate the Regulations and Standards levied for handling GH2.
- Comply with the Regulations and Standards for Handling Green Hydrogen.
- Respond promptly and effectively to emergencies and potential hydrogen leaks, including evacuation procedures, communication with emergency services, and implementation of emergency response plans

| Duration: 20:00 | Duration: 60:00 |
|---|---|
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> • Explain the significance of calibrating the performance of equipment. • Detail the steps involved in maintaining the equipment performance. • Elaborate why Compliance with Regulations and Standards are of utmost importance while operating with GH2. • Discuss the risks involved while handling GH2. • List down the safety procedures to be followed for handling GH2. • Define the first aid to be done for cryogenic burns and asphyxiation due to inhaling GH2. • Detail how to be prepared for handling emergency situations. | <ul style="list-style-type: none"> • Perform the steps for calibrating the performance of equipment. • Demonstrate the process of maintaining the equipment performance. • Illustrate the Regulations and Standards levied for handling GH2. • Comply with the Regulations and Standards for Handling Green Hydrogen. • Follow the safety procedures and SOPs while handling green hydrogen. • Demonstrate the control measures to be taken in case of leakage. • Role play with the first aid methods to be followed for cryogenic burns. • Respond promptly and effectively to emergencies and potential hydrogen leaks, including evacuation procedures, communication with emergency services, and implementation of emergency response plans |
| Classroom Aids | |
| Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser | |
| Tools, Equipment and Other Requirements | |
| Pressure gauges, Flow meters, Temperature sensors, Lubricants, filters, Personal protective equipment (flame-resistant suits, goggles, face shields, neoprene or nitrile gloves, safety boots, respirators, and hearing protection), Cryogenic protective clothing and gloves, Hydrogen flame detectors (UV, IR, multi-spectrum, video image), Oil-free equipment, intrinsically safe tools, First-aid kit, Fire extinguishers, Fire hoses, LLMS(learning version) | |

Module 6: Employability Skills

Mapped to DGT/VSQ/N0101, v1.0

Terminal Outcomes:

- Appraise the significance of employability skills in meeting the job requirements
- Identify constitutional values, civic rights, duties, personal values and ethics and environmentally sustainable practices.
- Illustrate English and communication skills, customer service, entrepreneurship, and getting ready for jobs and apprenticeship.

| Duration: 15:00 | Duration: 15:00 |
|--|---|
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> • Detail the importance of Employability Skills in meeting the job requirements • Explain constitutional values, civic rights, duties, citizenship, responsibility towards society etc. that are required to be followed to become a responsible citizen. • Describe positive attitude, self - motivation, problem solving, time management skills and continuous learning mindset in different situations. • Discuss the significance of reporting sexual harassment issues in time • Appraise the significance of using financial products and services safely and securely. • Explain the importance of managing expenses, income, and savings. • Detail the significance of approaching the concerned authorities in time for any exploitation as per legal rights and laws • Discuss the significance of using internet for browsing, accessing social media platforms, safely and securely • Categorize the need for identifying opportunities for potential business, sources for arranging money and potential legal and financial challenges • Discuss the significance of maintaining hygiene and dressing appropriately • Discuss how to search and register for apprenticeship opportunities | <ul style="list-style-type: none"> • Analyze 21st century skills. • Practice appropriate basic English sentences/phrases while speaking • Demonstrate how to communicate in a well -mannered way with others. • Illustrate working with others in a team • Demonstrate how to conduct oneself appropriately with all genders and PwD • Operate digital devices and use the associated applications and features, safely and securely • Differentiate between types of customers • Create a biodata • Experiment with various sources to search and apply for jobs • Identify customer needs and address them • Compose the significance of dressing up neatly and maintaining hygiene for an interview |
| Classroom Aids | |
| Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser, UPS, LCD Projector, Computer Tables & chairs | |
| Tools, Equipment and Other Requirements | |
| Computer (PC) with latest configurations – and Internet connection with standard operating system and standard word processor and worksheet software (Licensed) (all software should either be latest version or one/two version below), Scanner cum Printer. | |

Annexure

Trainer Requirements

| Trainer Prerequisites | | | | | | |
|-----------------------------------|------------------------|------------------------------|------------------------|---------------------|----------------|---------|
| Minimum Educational Qualification | Specialization | Relevant Industry Experience | | Training Experience | | Remarks |
| | | Years | Specialization | Years | Specialization | |
| Any Degree | Handling DG/ Chemicals | 2 | Handling DG/ Chemicals | | | |

| Trainer Certification | |
|---|--|
| Domain Certification | Platform Certification |
| Certified for Job Role: “Green Hydrogen Refuelling Hub Operator” mapped to QP: “LSC/Q3903, v1.0”. Minimum accepted score is 80% | Recommended that the Trainer is certified for the Job Role: “Trainer (VET and Skills)”, mapped to the Qualification Pack: “MEP/Q2601, V2.0”. Minimum accepted score is 80% |

Assessor Requirements

| Assessor Prerequisites | | | | | | |
|-----------------------------------|------------------------|------------------------------|------------------------|--------------------------------|----------------|---------|
| Minimum Educational Qualification | Specialization | Relevant Industry Experience | | Training/Assessment Experience | | Remarks |
| | | Years | Specialization | Years | Specialization | |
| Any Degree | Handling DG/ Chemicals | 2 | Handling DG/ Chemicals | | | |

| Assessor Certification | |
|---|---|
| Domain Certification | Platform Certification |
| Certified for Job Role: “Green Hydrogen Refuelling Hub Operator” mapped to QP: “LSC/Q3903, v1.0”. Minimum accepted score is 80% | Recommended that the Assessor is certified for the Job Role: “Assessor (VET and Skills)”, mapped to the Qualification Pack: “MEP/Q2701, V2.0” with Minimum score of 80% |

Assessment Strategy

The emphasis is on 'learning-by-doing' and practical demonstration of skills and knowledge based on the performance criteria. Accordingly, assessment criteria for each job role is set and made available in qualification pack.

The assessment papers for both theory and practical would be developed by Subject Matter Experts (SME) hired by Logistics Sector Skill Council or with the LSC accredited Assessment Agency as per the assessment criteria mentioned in the Qualification Pack. The assessments papers would also be checked for the various outcome-based parameters such as quality, time taken, precision, tools & equipment requirement etc.

Each NOS in the Qualification Pack (QP) is assigned a relative weightage for assessment based on the criticality of the NOS. Therein each Element/Performance Criteria in the NOS is assigned marks on relative importance, criticality of function and training infrastructure.

The following tools would be used for final assessment:

1. **Practical Assessment:** This comprises of a creation of mock environment in the skill lab which is equipped with all equipment required for the qualification pack.

Candidate's soft skills, communication, aptitude, safety consciousness, quality consciousness etc. is ascertained by observation and marked in observation checklist. The outcome is measured against the specified dimensions and standards to gauge the level of their skill achievements.

2. **Viva/Structured Interview:** This tool is used to assess the conceptual understanding and the behavioral aspects with regard to the job role and the specific task at hand. It also includes questions on safety, quality, environment and equipment etc.
3. **On-Job Training:** OJT would be evaluated based on standard log book capturing departments worked on, key observations of learner, feedback and remarks of supervisor or mentor.
4. **Written Test:** Question paper consisting of 100 MCQs (Hard:40, Medium:30 and Easy: 30) with questions from each element of each NOS. The written assessment paper is comprised of following types of questions:
 - i. True / False Statements
 - ii. Multiple Choice Questions
 - iii. Matching Type Questions
 - iv. Fill in the blanks
 - v. Scenario based Questions
 - vi. Identification Questions

QA Regarding Assessors:

Assessors are selected as per the “eligibility criteria” laid down by LSC for assessing each job role. The assessors selected by Assessment Agencies are scrutinized and made to undergo training and introduction to LSC Assessment Framework, competency based assessments, assessors guide etc. LSC conducts “Training of Assessors” program from time to time for each job role and sensitize assessors regarding assessment process and strategy which is outlined on following mandatory parameters:

- 1) Guidance regarding NSQF
- 2) Qualification Pack Structure
- 3) Guidance for the assessor to conduct theory, practical and viva assessments
- 4) Guidance for trainees to be given by assessor before the start of the assessments.
- 5) Guidance on assessments process, practical brief with steps of operations practical observation checklist and mark sheet
- 6) Viva guidance for uniformity and consistency across the batch.
- 7) Mock assessments
- 8) Sample question paper and practical demonstration

References

Glossary

| Term | Description |
|-----------------------------|---|
| Key Learning Outcome | Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application). |
| Training Outcome | Training outcome is a statement of what a learner will know, understand and be able to do upon the completion of the training. |
| Terminal Outcome | Terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome. |

Acronyms and Abbreviations

| Term | Description |
|------|---|
| QP | Qualification Pack |
| NSQF | National Skills Qualification Framework |
| NSQC | National Skills Qualification Committee |
| NOS | National Occupational Standards |