Model Curriculum

QP Name: Cold Chain Specialist (Green Engineering)

QP Code: LSC/Q9202

QP Version: 1.0

NSQF Level: 6

Model Curriculum Version: 1.0

Logistics Sector Skill Council|| Logistics Sector Skill Council, No. 480 A, 7th floor Khivraj Complex 2, Anna Salai, Nandanam, Chennai, Tamil Nadu 600035

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Training Parameters

Sector	Logistics
Sub-Sector	Cold Chain Logistics Solutions
Occupation	Engineering, Sustainability
Country	India
NSQF Level	6
Aligned to NCO/ISCO/ISIC Code	NCO-2015/1324
Minimum Educational Qualification and Experience	Completed 4-year UG program (In Mechanical/ Electrical/ Electronics/ Refrigeration Engineering/ Food Technology/ Pharma/ Relevant trade) with 1 Year of experience in cold storage operations OR Completed 2-year diploma (after 12th Grade) in Mechanical/ Electrical/ Electronics/ Refrigeration Engineering/ Food Technology/ Pharma/ Relevant trade with 3 Years of experience in cold storage operations OR Previous relevant Qualification of NSQF Level (5.5) with 2 Years of experience in cold storage operations OR Previous relevant Qualification of NSQF Level (5) with 3 Years of experience in cold storage operations
Pre-Requisite License or Training	NA
Minimum Job Entry Age	23
Last Reviewed On	15/03/2024
Next Review Date	15/03/2027
NSQC Approval Date	15/03/2024
QP Version	1.0
Model Curriculum Creation Date	01/02/2024
Model Curriculum Valid Up to Date	15/03/2027
Model Curriculum Version	1.0
Minimum Duration of the Course	600
Maximum Duration of the Course	600

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:

- Plan maintenance schedule and allocate resources to ensure effective maintenance of refrigeration equipment
- Manage energy efficiency in cold chain by employing effective and eco-friendly ways to minimize energy consumption
- Administer modified atmosphere requirements of cold storage rooms as per products stored
- Design effective water treatment programme for water circulation and chemical feed to avoid contamination
- Implement effluent treatment programme as per compliance
- Manage engineering systems to minimize energy consumption and improve operational efficiency
- Manage workplace for safe and healthy work environment by following and ensuring compliance to regulatory and safety norms

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**	**40**			**60**
Module 1: Introduction to Cold Chain Specialist (Green Engineering)	20	40			60
LSC/N9201 – Implement energy efficiency and greening aspects in the cold storage V1.0 NSQF Level 6	**30**	**45**	**15**		**90**
Module 2: Manage energy efficiency in the cold chain	30	45	15		90
LSC/N9202 – Oversee modified atmosphere requirements for the products V1.0 NSQF Level 6	**30**	**45**	**15**		**90**

Module 3: Oversee modified atmosphere requirements for the products	30	45	15		90
LSC/N9203 – Undertake water treatment and conservation V1.0 NSQF Level 6	**30**	**45**	**15**		**90**
Module 4: Undertake water treatment and conservation	30	45	15		90
LSC/N9204 – Manage the renewed engineering system with greening aspects in cold storage V1.0 NSQF Level 6	**30**	**45**	**15**		**90**
Module 5: Manage engineering systems	30	45	15		90
LSC/N9901 – Maintain food and personal safety, health, and hygiene in cold storage plant V1.0 NSQF Level 6	**30**	**60**			**90**
Module 6: Compliance to health, safety, and security norms	30	60			90
DGT/VSQ/N0103 Employability Skills	**30**	**60**			**90**
Total Duration	**200**	**340**	**60**		**600**

Module Details

Module 1: Introduction to Cold Chain Specialist (Green Engineering)

Mapped to Bridge Module

Terminal Outcomes:

- Describe the basic structure and function of supply chain
- Detail the various functions of a cold chain specialist (green engineering)

Duration: 20:00	**Duration: 40:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Classify the components of supply chain and logistics sector. • Detail the various sub-sectors and the opportunities in them. • Identify various activities in cold chain, warehouse etc. • Detail your job role as cold chain specialist (green engineering) and its interface with other job roles. • Detail the various cold storage equipment such as evaporators, compressors, sensors etc. • Discuss the documentation requirements in cold storage maintenance operations.	• Perform the job role of a cold chain specialist (green engineering). • Identify the various documentation involved in cold chain maintenance operation.
Classroom Aids	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser	
Tools, Equipment and Other Requirements	
Computers with web camera, MS Project, MS Office, WMS (learning version).	

Module 2: Manage energy efficiency in the cold chain

Mapped to LSC/N9201, v1.0

Terminal Outcomes:

- Demonstrate the steps to be followed for management of energy efficiency in the cold chain

Duration: 30:00	Duration: 45:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the parameters impacting energy usage. • Discuss the process of analysing energy consumption and corresponding threshold parameters to identify inefficiencies. • Explain the process of thermographic inspections. • Explain the procedure for designing Design solutions to optimize energy consumption by using day light and occupancy sensors, adjusting chillers, improving evaporator performance etc. • State effective ways to maximize energy efficiencies in cold storage. • Explain the importance of replacing power consuming devices with smart appliances. • List out the alternative sources of energy. • Describe eco-friendly techniques to optimize energy usage conditions. • Discuss the process of identifying appropriate condenser, reduce heat load and engage automatic refrigerant leak detection systems. • Describe the procedures for waste management and disposal.	• Identify parameters impacting energy usage. • Analyse energy consumption and corresponding threshold parameters to identify inefficiencies. • Perform thermographic inspection to analyse cold areas with poor insulation. • Identify ways to fix inefficiencies to improve performance. • Design solutions to optimize energy consumption by using day light and occupancy sensors, adjusting chillers, improving evaporator performance etc. • Identify avenues to promote renewable energy such biogas plants. • Implement effective ways to maximize energy efficiencies in cold storage. • Apply eco-friendly techniques to optimize energy usage conditions. • Identify appropriate condenser, reduce heat load and engage automatic refrigerant leak detection systems. • List out the parameters of global sustainability. • List out the legislative requirements and organisational procedures for waste management and disposal.
Classroom Aids	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser	
Tools, Equipment and Other Requirements	
WMS (learning version), MS Project, MS Office, Computer, Projector, TV, Stationery, Worksheets, Statistical Tools compressor, condenser, evaporator, temperature and humidity sensor, thermostat, occupancy sensor and daylight sensor, insulation equipment/ system, cold room setup, piping set up, leak detection system	

Module 3: Oversee modified atmosphere requirements for the products

Mapped to LSC/N9202, V1.0

Terminal Outcomes:

- Detail the steps in overseeing atmosphere requirements for products

Duration: 30:00	Duration: 45:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define the right temperature to be maintained as per the commodity stored. • Explain the right mix of gas to maintain the chilling effect and proper sanitation to avoid pathogenic microorganisms. • Explain the process of evaluating products for chilling injuries. • List the documentation relevant to statutory compliances and cleaning. • Discuss the process of documenting faults in the readings of required modified atmosphere conditions.	• Define the right temperature to be maintained as per the commodity stored. • Apply the right mix of gas to maintain the chilling effect and proper sanitation to avoid pathogenic microorganisms. • Evaluate products for chilling injuries. • Record periodically the adjustments done to maintain the moderate temperature. • Prepare documentation relevant to statutory compliances and cleaning. • Document faults in the readings of required modified atmosphere conditions.
Classroom Aids	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser	
Tools, Equipment and Other Requirements	
WMS (learning version), MS Project, MS Office, Computer, Projector, TV, Stationery, Worksheets, Statistical Tools compressor, condenser, evaporator, temperature and humidity sensor, thermostat, CO2 tanks, Oxygen tanks, Ethylene tanks, Nitrogen generator, cold room, process monitoring equipment, gas flow control and monitoring equipment	

Module 4: Undertake water treatment and conservation

Mapped to LSC/N9203, v1.0

Terminal Outcomes:

- Detail the appropriate steps for management of water and effluent treatment programme

Duration: 30:00	Duration: 45:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the steps in designing effective water treatment programme incorporating controlled water circulation, chemical feed, and routine monitoring. • State cost effective ways for treatment and recycling COD (chemical oxygen demand) of wastewater. • Analyse treated effluent for compliance to specifications. • Discuss the inspection process for safety and hygiene of treatment area. • Explain rainwater harvesting. • Discuss the inspection process for chemical feed system for leaks. • Explain the inspection process for overfeed/ underfeed of water treatment chemicals. • Describe the processes to maintain zero wastage, treatment of wastewater and recycling of water.	• Design effective water treatment programme incorporating controlled water circulation, chemical feed and routine monitoring. • Identify cost effective ways for treatment and recycling COD (chemical oxygen demand) of wastewater. • Examine treated effluent for compliance to specifications. • Report efficacy of water treatment programme. • Examine safety and hygiene of treatment area. • Identify faults and take corrective actions. • Implement rainwater harvesting. • Inspect chemical feed system for leaks. • Inspect for overfeed/ underfeed of water treatment chemicals.
Classroom Aids	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser	
Tools, Equipment and Other Requirements	
WMS (learning version), MS Project, MS Office, Computer, Projector, TV, Stationery, Worksheets, Statistical Tools, cold room, water circulation unit, mini effluent treatment set up, chemical testing facility, biological testing facility	

Module 5: Manage engineering systems

Mapped to LSC/N9204, v1.0

Terminal Outcomes:

- Demonstrate the steps to be followed for effective management of engineering systems

Duration: 30:00	Duration: 45:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the steps to be followed in management of control systems to minimize power consumption of evaporators, condensers and compressors through automation and hydraulic checks. • List engineering system components which need periodic inspection • Examine pressure drops, corrosion, forst etc. to decide on maintenance requirements. • List components which require revamping, upgradation, reinsulation. • Discuss the process of reporting power consumption of refrigeration systems and revamps identified. • Discuss the process of reporting information on operation of evaporation, condesors etc.	• Manage control systems to minimize power consumption of evaporators, condensers and compressors through automation and hydraulic checks. • Identify engineering system components which need periodic inspection. • Analyse pressure drops, corrosion, frost etc. to decide on maintenance requirements. • Identify components which require revamping, upgradation, reinsulation. • Report power consumption of refrigeration systems and revamps identified. • Record information on operation of evaporation,condesors etc.
Classroom Aids	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser	
Tools, Equipment and Other Requirements	
WMS (learning version), MS Project, MS Office, Computer, Projector, TV, Stationery, Worksheets, Statistical Tools compressor, condenser, evaporator, temperature and humidity sensor, thermostat, different types of refrigerants, cold room, piping systems, monitor and control systems, pressure gauges, tools and tackles,	

Module 6: Compliance to health, safety and security norms

Mapped to LSC/N9901, v1.0

Terminal Outcomes:

- Describe health, safety, and security procedures in cold storage plants
- Demonstrate the inspection procedure to ensure appropriate and safe conditions of activity area and equipment
- Illustrate the standard protocol to be followed during emergency situations, accidents and breach of safety

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Detail health, safety and security procedures in cold storage plants. • Explain the inspection procedure to ensure appropriate and safe conditions of activity area and equipment. • Detail hygiene and sanitation standards as per regulatory bodies such as FSSAI, APEDA. • Evaluate protective devices, pipelines and cold storage areas as per SOP. • Detail the pest control methods to be followed to ensure zero pest infestation. • Describe the SOP for safe handling of goods. • Explain the protocol to be followed during accident, emergency etc.	• Perform health and safety procedure in cold storage plants. • Follow safety precautionary methods. • Check the activity area and equipment for compliance to safety. • Check the pipeline and cold storage area are as per SOP. • Perform pest control as per SOP to avoid infestation. • Inspect adherence to standard operating procedures (SOP) while handling goods. • Implement standard protocol in case of emergency situations, accidents, and breach of safety.
Classroom Aids	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser	
Tools, Equipment and Other Requirements	
WMS (learning version), LLMS (learning version), MS Project, MS Office, Computer, Projector, TV, Stationery, Worksheets, Statistical Tools compressor, condenser, evaporator, temperature and humidity sensor, simulator, tools and tackles, consumables	

Module 7: Employability Skills

Mapped to DGT/VSQ/N0103, v1.0

Terminal Outcomes:

- Discuss the Employability Skills required for jobs in various industries
- Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
- Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan

Duration: *30:00*	**Duration**: *60:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Outline the importance of Employability Skills for the current job market and future of work. • List different learning and employability related GOI and private portals and their usage. • Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen. • Discuss relevant 21st century skills required for employment. • Highlight the importance of practicing 21st century skills like Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional. awareness, learning to learn etc. in personal or professional life. • Explain the importance of communication etiquette including active listening for effective communication. • Discuss the significance of escalating sexual harassment issues as per POSH act. • Discuss various financial institutions, products, and services.	• Research and prepare a note on different industries, trends, required skills and the available opportunities. • Demonstrate how to practice different environmentally sustainable practices. • Create a pathway for adopting a continuous learning mindset for personal and professional development. • Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone. • Read and understand text written in basic English. • Write a short note/paragraph / letter/e-mail using correct basic English. • Create a career development plan. • Identify well-defined short- and long-term goals. • Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette. • Write a brief note/paragraph on a familiar topic. • Role play a situation on how to work collaboratively with others in a team. • Demonstrate how to behave, communicate, and conduct appropriately with all genders and PWD.

• Explain the common components of salary such as Basic, PF, Allowances (HRA, TA, DA, etc.), tax deductions. • Discuss the legal rights, laws, and aids. • Describe the role of digital technology in day-to-day life and the workplace. • Discuss the significance of displaying responsible online behaviour while using various social media platforms. • Explain the types of entrepreneurship and enterprises. • Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan. • Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement. • Discuss various tools used to collect customer feedback. • Discuss the significance of maintaining hygiene and dressing appropriately. • Discuss the significance of maintaining hygiene and dressing appropriately for an interview. • List the steps for searching and registering for apprenticeship opportunities.	• Demonstrate how to conduct offline and online financial transactions, safely and securely and check passbook/statement. • Calculate income and expenditure for budgeting. • Demonstrate how to operate digital devices and use the associated applications and features, safely and securely. • Demonstrate how to connect devices securely to internet using different means. • Follow the dos and don'ts of cyber security to protect against cyber crimes. • Create an e-mail id and follow e- mail etiquette to exchange e -mails. • Show how to create documents, spreadsheets and presentations using appropriate applications. • Utilize virtual collaboration tools to work effectively. • Create a sample business plan, for the selected business opportunity. • Classify different types of customers. • Demonstrate how to identify customer needs and respond to them in a professional manner. • Draft a professional Curriculum Vitae (CV). • Use various offline and online job search sources to find and apply for jobs. • Role play a mock 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	Cold Chain	2	Cold Chain			

Trainer Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "Cold Chain Specialist (Green Engineering)" mapped to QP: "LSC/Q9202, 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" with minimum score of 80%

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Any degree	Cold Chain	2	Cold Chain			

Assessor Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "Cold Chain Specialist (Green Engineering)" mapped to QP: "LSC/Q9202, 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. are 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 behavioural 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 logbook 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
Declarative Knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
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).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
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