Model Curriculum

QP Name: Refrigeration Equipment Maintenance Specialist

QP Code: LSC/Q9101

QP Version: 2.0

NSQF Level: 5

Model Curriculum Version: 2.0

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Training Parameters

Sector	Logistics
Sub-Sector	Cold Chain
Occupation	Maintenance
Country	India
NSQF Level	5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/ NIL
Minimum Educational Qualification and Experience	Completed 2nd year of UG/ Diploma in Mechanical / Electrical / Electronical / Refrigeration engineering Or Pursuing 2nd year of UG/ Diploma and continuous education in Mechanical / Electrical / Electronical / Refrigeration engineering Or 12th Grade pass + 2 year cold chain experience in handling refrigeration equipment Or Previous relevant Qualification of NSQF Level 4 (in cold chain) and with minimum education as 8th Grade pass + 3 year relevant experience in cold storage/ refrigeration/ air conditioning equipment maintenance operations as an apprentice or in regular employment
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18
Last Reviewed On	28/02/2023
Next Review Date	28/02/2026
NSQC Approval Date	28/02/2023
QP Version	2.0
Model Curriculum Creation Date	07/10/2022
Model Curriculum Valid Up to Date	28/02/2026
Model Curriculum Version	2.0
Minimum Duration of the Course	570
Maximum Duration of the Course	570

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
- Monitor maintenance activities to ensure compliance to quality standards
- Administer timely repairs and service of refrigeration equipment to ensure uninterrupted functioning
- Provide training to plant engineers for safe handling and maintenance of refrigeration equipment
- Manage workplace for safe and healthy work environment by following and ensuring compliance to regulatory and safety norms
- Communicate effectively with colleagues and clients for proper information flow

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 Refrigeration Equipment maintenance Specialist	20	10			30
LSC/N9101 – Plan the maintenance of refrigeration equipment V1.0 5	**20**	**65**	**5**		**90**
Module 2: Planning Maintenance	20	65	5		90
LSC/N9102 – Monitor the maintenance of refrigeration equipment V2.0 5	**20**	**65**	**5**		**90**
Module 3: Monitor maintenance activities	20	65	5		90

LSC/N9103 – Oversee service and repair refrigeration equipment V2.0 5	**20**	**65**	**5**		**90**
Module 4: Supervision of repairs and services	20	65	5		90
LSC/N9104 – Undertake training for plant engineers V1.0 3	**20**	**65**	**5**		**90**
Module 5: Training on handling and maintenance of refrigeration equipment	20	65	5		90
LSC/N9901 – Maintain food and personal safety, health, and hygiene in cold storage plant V1.0 5	**20**	**35**	**5**		**60**
Module 6: Compliance to health, safety and security norms	20	35	5		60
LSC/N9902 Communicate effectively with colleagues and clients V1.0 5	**20**	**35**	**5**		**60**
Module 7: Effective Communication	20	35	5		60
Employability Skills DGT/VSQ/N0102	**30**	**30**			**60**
Total Duration	**170**	**370**	**30**		**570**

Module Details

Module 1: Introduction to Refrigeration Equipment maintenance Specialist

Mapped to Bridge Module

Terminal Outcomes:

- Describe the basic structure and function of supply chain
- Detail the various functions of a refrigeration Equipment maintenance Specialist

Duration: *20:00*	**Duration**: *10:00*
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 refrigeration equipment maintenance specialist 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	• Demonstrate the use of evaporators, compressor etc. • Explain 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	

Module 2: Planning Maintenance

Mapped to LSC/9101, v1.0

Terminal Outcomes:

- Demonstrate the maintenance procedure of refrigeration equipment as per SOP.

Duration: *20:00*	**Duration**: *65:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the maintenance procedure of refrigeration equipment • Explain the maintenance procedure of refrigeration equipment • Evaluate compliance of plan to regulatory standards and IEEE code of practice • Maintain a checklist for evaporators, electrical connections etc. • Explain the procedure for allocation of manpower • List priority wise maintenance activities with deadlines • List the tools and equipment for maintenance activity	• Plan and schedule maintenance of refrigeration equipment • Follow regulatory standards and IEEE code of practice • Prepare the maintenance checklist for evaporators, electrical connections etc. • Allocate manpower for maintenance activity • Provide necessary tools and equipment to carry out maintenance work
Classroom Aids	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser	
Tools, Equipment and Other Requirements	
Statistical tools, ERP, stationery compressor, condenser, evaporator, temperature, and humidity sensor	

Module 3: Monitor maintenance activities

Mapped to LSC/N9102, V1.0

Terminal Outcomes:

- Demonstrate effective monitoring of maintenance activities as per SOP

Duration: *20:00*	**Duration**: *65:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Detail the cost budget for maintenance with respect to time and quality • Detail precautions in terms of safety towards product stored, workers, environment during maintenance activity • Describe the procedure involved in maintenance of a refrigeration equipment • Examine maintenance records/logs for timely updates • Evaluate the work carried out by the workers	• Inspect adherence to quality, time and cost budgets allocated for maintenance • Perform maintenance of refrigeration equipment as per SOP • Demonstrate appropriate maintenance activities for refrigeration equipment • Inspect the logs for timely updates • Provide expert inputs to subordinates for carrying out maintenance activity • Assess timely completion of activities by workers • Assess work efficiency to suggest training needs
Classroom Aids	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser	
Tools, Equipment and Other Requirements	
MS Office, compressor, condenser, evaporator, temperature and humidity sensor, simulator, cold storage equipment, gas leak detectors, tools and tackles, consumables	

Module 4: Supervision of repairs and services

Mapped to LSC/N9103, v1.0

Terminal Outcomes:

- Detail the appropriate steps for supervision of repairs and services as per SOP

Duration: *20:00*	**Duration**: *65:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Follow the maintenance as per the industry practices • Detail various checks to be performed for thermostats, compressors, electrical systems, defrost systems etc. • Describe the procedure to repair compressor thermostat etc. • Examine the working of cold storage celling panel etc. • Explain the safety procedure to be followed during repair activity • Document all the repair and maintenance activities relating to refrigeration, electrical system, equipment components • Discuss the performance and efficiency standards for optimal functioning refrigeration equipment's	• Perform maintenance activities as per manufacturer's instructions and industry practices • Perform check on thermostat compressor etc. • Perform essential checks and repair of thermostats, compressors, electrical systems, defrost systems etc. • Inspect cold store ceiling panel, suspension rods etc. for proper functioning • Inspect adherence to safety and hygiene requirements during repair activities • Report details of repair activities relating to refrigeration, electrical system, equipment components • Analyze performance of refrigeration equipment in terms of operating efficiency, downtime and conformity to requirements
Classroom Aids	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser	
Tools, Equipment and Other Requirements	
MS Office compressor, condenser, evaporator, temperature and humidity sensor, simulator, tools and tackles, consumables, cold storage equipment, gas leak detectors, electrical systems, start relays and defrost timers, pressure pumps, etc.	

Module 5: Training on handling and maintenance of refrigeration equipment

Mapped to LSC/N9104, v1.0

Terminal Outcomes:

- Demonstrate effective training on safe handling of equipment's condensers, evaporators etc.
- Detail the maintenance procedure for refrigeration equipment such as dismantling, tracing faults, repair and service, component replacement, control circuit repairs, etc.

Duration: *10:00*	**Duration**: *65:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the process of delivering training on safe handling of equipment's, condensers, evaporators etc. • Detail harmful effects of refrigerants to the environment • Explain the maintenance process for dismantling, tracing faults, component replacement etc. • Discuss the procedure for delivering training on emergency responses during breakdown during emergency response • Explain the proper usage of tools and techniques	• Provide training to plant engineers on safe handling of refrigerants • Understand the harmful effect of refringent • Provide training on appropriate procedures for handling evaporators, condenser etc. • Demonstrate maintenance of refrigeration equipment such as dismantling, tracing faults, repair and service, component replacement, control circuit repairs, etc. • Provide training on emergency responses during breakdown • Provide training on usage of tools, techniques etc. • Provide training on numerical calculations and reporting necessary for performing the activity
Classroom Aids	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser	
Tools, Equipment and Other Requirements	
MS Office compressor, condenser, evaporator, temperature and humidity sensor, simulator, tools and tackles, consumables, cold storage equipment, gas leak detectors, electrical systems, start relays and defrost timers, pressure pumps, etc.	

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:*20:00*	**Duration**: *35:00*
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	
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: Effective Communication

Mapped to LSC/N9902, v1.0

Terminal Outcomes:

- Demonstrate effective communication skills to understand targets and performance indicators
- Establish good client relationships and maintain them effectively

Duration: *20:00*	**Duration**: *35:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Understand the target and performance indicator from seniors • Detail the progress to superiors • Explain the behavior to be followed in workplace • Breakdown issues among colleagues • Interpret cooperation, coordination to be established with colleagues and clients • Recognize the client requirement • Manage client escalation immediately • Manage good client relationship	• Communicate effectively with seniors to understand targets, performance indicators • Practice responsible, disciplined and respectful behavior in the workplace • Resolve conflicts amongst colleagues • Practice cooperation, coordination, etiquette and collaboration with colleagues and clients • Provide expert inputs and guide colleagues • Communicate effectively with clients to understand work requirements • Solve client escalations effectively • Establish and maintain good client relationships
Classroom Aids	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Board eraser	
Tools, Equipment and Other Requirements	
MS Project, MS Office, Computer, Projector, TV, Stationery, Worksheets, Statistical Tools compressor, condenser, evaporator, temperature and humidity sensor, simulator, tools and tackles, consumables	

Module 8: Employability Skills

Mapped to DGT/VSQ/N0102, 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**: *30:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the Employability Skills required for jobs in various industries • 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 importance of relevant 21st century skills. • Describe the benefits of continuous learning. • Explain the importance of active listening for effective communication • Discuss the significance of working collaboratively with others in a team • Discuss the significance of escalating sexual harassment issues as per POSH act. • List the common components of salary and compute income, expenditure, taxes, investments etc. • Discuss the legal rights, laws, and aids • Describe the role of digital technology in today's life • Discuss the significance of displaying responsible online behaviour while browsing, using various social media platforms, e-mails, etc., safely and securely • Explain the types of entrepreneurship and enterprises • Discuss how to identify opportunities for potential business, sources of funding and	• Practice different environmentally sustainable practices. • Exhibit 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. • Demonstrate to use basic English sentences for everyday conversation in different contexts, in person and over the telephone • Read and interpret text written in basic English • Write a short note/paragraph / letter/e - mail using basic English • Create a career development plan with well-defined short- and long-term goals • Communicate effectively using verbal and nonverbal communication etiquette. • Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD • Outline the importance of selecting the right financial institution, product, and service • Demonstrate how to carry out offline and online financial transactions, safely and securely • Operate digital devices and use the associated applications and features, safely and securely • Create sample word documents, excel sheets and presentations using basic features

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 • Detail the significance of analyzing different types and needs of customers • Explain the significance of identifying customer needs and responding to them in a professional manner. • Discuss the significance of maintaining hygiene and dressing appropriately • Explain the significance of maintaining hygiene and confidence during an interview • List the steps for searching and registering for apprenticeship opportunities	• Utilize virtual collaboration tools to work effectively • Devise a sample business plan, for the selected business opportunity • Create a professional Curriculum Vitae (CV) • Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively • Perform 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***	
Graduate or Diploma	Engineering	6	cold storage/refrigeration / air conditioning equipment maintenance operations	1	cold storage/refrigeration / air conditioning equipment maintenance operations	

Trainer Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "Refrigeration Equipment maintenance Specialist" mapped to QP: "LSC/Q9101, v2.0". Minimum accepted score is 80%	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "MEP/Q2601". Minimum accepted score is 80%

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
12th Pass	NA	2	cold storage/refrigeration / air conditioning equipment maintenance operations	1	cold storage/refrigeration / air conditioning equipment maintenance operations	Graduation is preferred

Assessor Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "Refrigeration and Equipment Maintenance Specialist" mapped to QP: "LSC/Q9101, v2.0". Minimum accepted score is 80%	Recommended that the Assessor is certified for the Job Role: "Assessor", mapped to the Qualification Pack: "MEP/Q2601". Minimum accepted score is 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
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