COMPETENCY STANDARD

FOR

Refrigeration and Air Conditioning

(Light Engineering Sector)

Level: 03

Competency Standard Code: LECS0004L3V1

National Skills Development Authority
Prime Minister's Office, Bangladesh

Table of Contents

Introduction

The National Skills Development Authority (NSDA) aims to enhance an individual's employability by certifying completeness with skills. NSDA works to expand the skilling capacity of identified public and private training providers qualitatively and quantitatively. It also aims to establish and operationalize a responsive skill ecosystem and delivery mechanism through a combination of well-defined set of mechanisms and necessary technical supports.

Key priority economic growth sectors identified by the government have been targeted by NSDA to improve current job skills along with existing workforce to ensure required skills to industry standards. Training providers are encouraged and supported to work with industry to address identified skills and knowledge to enable industry growth and increased employment through the provision of market responsive inclusive skills training programme.

Refrigeration and Airconditioning is selected as one of the priority occupations of **Light Engineering** Sector. This standard is developed to adopt a demand driven approach to training with effective inputs from Industry Skills Councils (ISC's), employer associations and employers.

Generally, a competency standard informs curriculum, learning materials, assessment and certification of trainees enrolled in TVET. Trainees who successfully pass the assessment will receive a qualification in the National Skills Qualification Framework (NSQF) and will be listed on the NSDA's online portal.

This competency standard is developed to improve skills and knowledge in accordance with the job roles, duties and tasks of the occupation and ensure that the required skills and knowledge are aligned to industry requirements. A series of stakeholder consultations, workshops were held to develop this document.

The document also details the format, sequencing, wording and layout of the Competency Standard for an occupation which is comprised of Units of Competence and its corresponding Elements.

Overview

A **competency standard** is a written specification of the knowledge, skills and attitudes required for the performance of an occupation, trade or job corresponding to the industry standard of performance required in the workplace.

The purpose of a competency standards is to:

- provide a consistent and reliable set of components for training, recognising and assessing people's skills, and may also have optional support materials
- enable industry recognised qualifications to be awarded through direct assessment of workplace competencies
- encourage the development and delivery of flexible training which suits individual and industry requirements
- encourage learning and assessment in a work-related environment which leads to verifiable workplace outcomes

Competency standards are developed by a working group comprised of representative from NSDA, Key Institutions, ISC, and industry experts to identify the competencies required of an occupation in **Light Engineering** sector.

Competency standards describe the skills, knowledge and attitude needed to perform effectively in the workplace. CS acknowledge that people can achieve technical and vocational competency in many ways by emphasizing what the learner can do, not how or where they learned to do it.

With competency standards, training and assessment may be conducted at the workplace or at training institute or any combination of these.

Competency standards consist of a number of units of competency. A unit of competency describes a distinct work activity that would normally be undertaken by one person in accordance with industry standards.

Units of competency are documented in a standard format that comprises of:

- unit title
- nominal duration
- unit code
- unit descriptor
- elements and performance criteria
- variables and range statement
- curricular content guide
- assessment evidence guide

Together, all the parts of a unit of competency:

- describe a work activity
- guide the assessor to determine whether the candidate is competent or not yet competent

The ensuing sections of this document comprise of a description of the relevant occupation, trade or job with all the key components of a unit of competency, including:

- a chart with an overview of all Units of Competency for the relevant occupation, trade or job including the Unit Codes and the Unit of Competency titles and corresponding Elements
- the Competency Standard that includes the Unit of Competency, Unit Descriptor, Elements and Performance Criteria, Range of Variables, Curricular Content Guide and Assessment Evidence Guide

Level descriptors of NTVQF/ NSQF (BNQF 1-6)

Level & Job classification	Knowledge Domain	Skills Domain	Responsibility Domain
6 Mid-Level Manager/ Sub Assistant Engineer	Comprehensive actual and theoretical knowledge within a specific work or study area with an awareness of the validity and limits of that knowledge, able to analyze, compare, relate and evaluate.	Specialised and wider range of cognitive and practical skills required to provide leadership in the development of creative solutions to defined problems. Communicate professional issues and solutions to the team and to external partners/users.	Work under broad guidance and self-motivation to execute strategic and operational plan/s. Lead lower-level management. Diagnose and resolve problems within and among work groups.
5 Supervisor	Broad knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to scrutinize and break information into parts by identifying motives or causes.	Broad range of cognitive and practical skills required to generate solutions to specific problems in one or more work or study areas. Communicate practice-related problems and possible solutions to external partners.	Work under guidance of management and self-direction to resolve specific issues. Lead and take responsibility for the work and actions of group/team members. Bridge between management.
4 Highly Skilled Worker	Broader knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to solve problems to new situations by comparing and applying acquired knowledge.	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying the full range of methods, tools, materials and information. Communicate using technical terminology and IT technology with partners and users as per workplace requirements.	Work under minimal supervision in specific contexts in response to workplace requirements. Resolve technical issues in response to workplace requirements and lead/guide a team/ group.
3 Skilled Worker	Moderately broad knowledge in a specific work or study area, able to perceive ideas and abstract from drawing and design according to workplace requirements.	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools. Communicate with his team and limited external partners upholding the values, nature and culture of the workplace	Work or study under supervision with considerable autonomy. Participate in teams and responsible for group coordination.
2 Semi-Skilled Worker	Basic understanding of underpinning knowledge in a specific work or study area, able to interpret and apply common occupational terms and instructions.	Skills required to carry out simple tasks, communicate with his team in the workplace presenting and discussing results of his work with required clarity.	Work or study under supervision in a structured context with limited scope of manipulation
1 Basic Skilled Worker	Elementary understanding of ability to interpret the underpinning knowledge in a specific study area, able to interpret common occupational terms and instructions.	Specific Basic skills required to carry out simple tasks. Interpret occupational terms and present the results of own work within guided work environment/ under supervision.	Work under direct supervision in a structured context with limited range of responsibilities.

List of Abbreviations

NSDA - National Skills Development Authority

CS – Competency Standard

ISC – Industry Skills Council

NSQF – National Skills Qualifications Framework

BNQF – Bangladesh National Qualifications Framework

NTVQF – National Technical and Vocational Qualifications Framework

SCVC – Standards and Curriculum Validation Committee

TVET – Technical Vocational Education and Training

UoC – Unit of Competency

STP – Skills Training Provider

OSH – Occupational Safety and Health

PPE – Personal Protective Equipment

SOP – Standard Operating Procedures

Approval of Competency Standard

Members of the Approval Committee:

Member	Signature
Dulal Krishna Saha Executive Chairman (Secretary) National Skills Development Authority (NSDA)	21.06.21
Md. Nurul Amin Member (Admin & Finance) And Member (Registration & Certification) Joint Secretary National Skills Development Authority (NSDA)	21.06.21
Alif Rudaba Member (Planning & Skills Standard) Joint Secretary National Skills Development Authority (NSDA)	

21.06.21

Dulal Krishna Saha
Executive Chairman (Secretary)
National Skills Development Authority (NSDA)

Competency Standards for National Skill Certificate –3 of Refrigeration and Airconditioning in Light Engineering Sector

Course Structure

SL	Unit Code and Title		UoC Level	Nominal Duration (Hours)
The Generic Competencies				**15**
1	GU005L3V1	Carry out workplace interaction in English	3	15
The Sector Specific Competencies				
The Occupation Specific Competencies				**260**
1	OURAC001L3V1	Service and Maintain Ice Cream Maker, Flaked Ice Maker and Beverage Cooler	3	50
2	OURAC002L3V1	Service and Maintain Mobile Refrigeration Plant	3	60
3	OURAC003L3V1	Service and Maintain Transport Refrigeration and Airconditioning Unit	3	60
4	OURAC004L3V1	Operate and Maintain Water Chiller Unit	3	60
5	OURAC005L3V1	Perform Recovery, Re-Cycling and Retrofitting	3	30
Total Nominal Learning Hours				**275**

Units & Elements at a Glance

The Generic Competencies

Code	Unit of Competency	Elements of Competency	Duration (Hours)
GU005L3V1	Carry out workplace interaction in English	1. Interpret workplace communication and etiquette 2. Interpret workplace documents 3. Participate in workplace meetings and discussions 4. Practice professional ethics at workplace	15

The Sector Specific Competencies

The Occupation Specific Competencies

Code	Unit of Competency	1. Elements of Competency	Duration (Hours)
OURAC001L3V1	Service and Maintain Ice Cream Maker, Flaker Ice Maker and Beverage Cooler	1. Prepare unit tools and workplace 2. Diagnose faults 3. Service and repair Ice cream maker, flakers ice maker and beverage cooler 4. Clean, maintain workplace tools and equipment	50
OURAC002L3V1	Service and Maintain Mobile Refrigeration Plant	1. Prepare for Servicing 2. Check and Test Mobile refrigeration plants 3. Repair mobile refrigeration plants 4. Repair mobile refrigeration plants	60
OURAC003L3V1	Service and Maintain Transport Refrigeration and Air Conditioning Unit	1. Prepare for maintenance activities 2. Inspect and adjust transport refrigeration accessories, controls, and operating conditions 3. Maintain lubrication system of transport refrigeration system 4. Maintain refrigeration system in transport refrigeration system 5. Maintain air distribution system in transport refrigeration system	60
OURAC005L3V1	Operate and Maintain Water Chiller Unit	1. Prepare for operation and maintenance 2. Check the different components 3. Carryout maintenance and servicing of chiller unit 4. Start-up & operate the chiller unit	60

OURAC006L3V1	Perform Refrigerant Recovery, Re-Cycling and Retrofitting	1. Prepare for recovery and recycling 2. Assess unit for recovery and recycling 3. Perform refrigerant recovery 4. Flash for retrofitting 5. Retrofit refrigerant	30

The Generic Competencies

Unit Code and Title	GU005L3V1: Carryout Workplace Interaction in English
Nominal Hours	15 Hours
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to carry out workplace interaction in English. It specifically includes the tasks of interpreting workplace communication and etiquette, interpreting workplace documents, participating in workplace meetings and discussions and practicing professional ethics at workplace.
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables Training Components
1. Interpret workplace communication and etiquette	1.1 Workplace code of conducts are interpreted as per organizational guidelines; 1.2 Appropriate lines of communication are maintained with supervisors and colleagues; 1.3 Workplace interactions are conducted in a **courteous manner** to gather and convey information; 1.4 Questions about routine **workplace procedures and matters** are asked and responded as required;
2. Interpret Workplace Documents	2.1 Workplace documents are interpreted as per standard; 2.2 Assistance is taken to aid comprehension when required from peers / supervisors; 2.3 Visual information / symbols / signage's are understood and followed; 2.4 Specific and relevant information are accessed from **appropriate sources;** 2.5 Appropriate medium is used to transfer information and ideas;
3. Participate in workplace meetings and discussions	3.1 Team meetings are attended on time and followed meeting procedures and etiquette; 3.2 Own opinions are expressed and listened to those of others without interruption; 3.3 Inputs are provided consistent with the meeting purpose and interpreted and implemented meeting outcomes;
4. Practice professional ethics at workplace	4.1 Responsibilities as a team member are demonstrated and kept promises and commitments made to others; 4.2 Tasks are performed in accordance with workplace procedures; 4.3 Confidentiality is respected and maintained; 4.4 Situations and actions considered inappropriate or which present a conflict of interest are avoided;

Range of Variables	
Variable	**Range** (may include but not limited to):
1. Courteous Manner	1.1 Effective questioning 1.2 Active listening 1.3 Speaking skills
2. Workplace Procedures and Matters	2.1 Notes 2.2 Agenda 2.3 Simple reports such as progress and incident reports 2.4 Job sheets 2.5 Operational manuals 2.6 Brochures and promotional material 2.7 Visual and graphic materials 2.8 Standards 2.9 OSH information 2.10 Signs
3. Appropriate Sources	3.1 HR Department 3.2 Managers 3.3 Supervisors
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 followed workplace code of conducts is as per organizational guidelines 1.2 maintained workplace documents as per standard 1.3 followed workplace instructions and symbols 1.4 followed and implemented meeting outcomes
2. Underpinning Knowledge	2.1 Workplace communication and etiquette 2.2 Workplace documents, signs and symbols 2.3 meeting procedure and etiquette
3. Underpinning Skills	3.1 Interpreting performance of workplace communication and etiquette 3.2 Interpreting workplace instructions and symbol 3.3 Interpreting workplace code of conducts is as per organizational guidelines 3.4 Interpreting workplace documents as per standard 3.5 Interpreting and implementing meeting outcomes

4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Relevant tools, Equipment, software and facilities needed to perform the activities. 5.2 Required learning materials.
6. Methods of Assessment	Methods of assessment may include but not limited to: 6.1 Written Test 6.2 Demonstration 6.3 Oral Questioning 6.4 Portfolio
7. Context of Assessment	7.1 Competency assessment must be done in a NSDA accredited assessment centre 7.2 Assessment should be done by an NSDA certified/ nominated assessor

Accreditation Requirements

National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NTVQF qualification must accredit training Providers. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

The Occupation Specific Competencies

Unit Code and Title	OURAC001L3V1: Service and Maintain Ice Cream Maker, Flaker Ice Maker and Beverage Cooler
Nominal Hours	**50 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to servicing and maintaining ice cream maker, flaker ice maker and beverage cooler in the workplace. It specifically includes tasks of diagnosing faults, servicing and repairing ice cream maker, flakers ice maker and beverage cooler.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Prepare unit tools and workplace	1.1 Appropriate **PPE** is selected and used in line with job requirements; 1.2 **Service manuals** and **service information** required for repair/maintenance are acquired as per standard procedure; 1.3 **Tools and equipment** are selected in accordance with job requirements; 1.4 Repairing instruments are calibrated as per instructions; 1.5 **Materials** are selected as per in line with work requirement;
2. Diagnose faults	2.1. Systematic **pre-testing procedure** is observed in accordance with manufacturer's instructions; 2.2. Motor terminals are checked using specified testing procedures; 2.3. Leak testing is performed to identify leakage of the unit as per standard procedure; 2.4. **Components of the electrical**/electronic circuit are checked according to standard procedures; 2.5. Symptoms of system faults are identified as per standard procedures; 2.6. Results of diagnosis and testing are documented as per workplace procedure;
3. Service and repair Ice cream maker, flakers ice maker and beverage cooler	3.1. Defective parts/components are check and replaced as per standard; 3.2. Control settings and adjustments are performed as per requirement; 3.3. Care and precaution in handling the unit is observed as per procedures; 3.4. Cleaning of unit is performed in accordance with standard procedures; 3.5. Unit is operated and **tested and checked** to ensure performance according to manufactures specifications;

4. Clean, maintain workplace tools and equipment	4.1. Routine maintenance is performed as per manufactures specifications; 4.2. Unsafe or faulty tools are identified and marked; 4.3. Tools and equipment are maintained and cleaned as per instruction manual; 4.4. Work place is cleaned in accordance with environmental requirement; 4.5. Tools and equipment are stored in appropriate location as per workplace procedures;
Range of Variables	
Variables	**Range** (may include but not limited to):
1. PPE	1.1 Hand gloves 1.2 Mask 1.3 Safety Shoes 1.4 Apron 1.5 Safety Goggles 1.6 Helmet
2. Service manuals	2.1 Service manual/schematic diagram/parts list 2.2 Operating instructions/User's/Owner's manual
3. Service information	3.1 Job Report Sheets 3.2 Customer index 3.3 Service flowchart 3.4 Stock and inventory record 3.5 Manufactures / suppliers technical data sheet
4. Tools	4.1 Pliers 4.2 Screwdriver 4.3 Hammer 4.4 Wrenches 4.5 Tube cutter 4.6 Wire stripper/crimper 4.7 Tube bender 4.8 Swaging tools set 4.9 Flaring tools set 4.10 Reamer 4.11 Allen key set 4.12 Lock ring plier set
5. Equipment	5.1 Gas welding equipment 5.2 Multimeter 5.3 Digital temperature measuring meter with probe 5.4 Thermo couple vacuum gauge 5.5 Digital pressure meter 5.6 Clamp - on meter 5.7 Leak detector 5.8 Gauge manifold with hose pipe

	5.9 Micron gauge 5.10 Charging station 5.11 Weighing scale 5.12 Two stages rotary type vacuum pump 5.13 Nitrogen cylinder with pressure regulator 5.14 Adaptor for nitrogen holes with valve (size – ¼") 5.15 Flame back arrester 5.16 Flash back arrester 5.17 Dust blower and vacuum cleaner 5.18 Refrigerant identifier 5.19 Refrigerant detector 5.20 Refrigerant recovery unit 5.21 Refrigerant recovery cylinder 5.22 Fire extinguisher
6. Materials	6.1 Refrigerants and dry nitrogen 6.2 Charging nipple 6.3 Copper tube 6.4 Filler rod 6.5 Welding flux 6.6 Filter drier/Strainer 6.7 Capillary tube 6.8 Lubricating oil 6.9 Copper and brass fittings 6.10 Cable 6.11 Lock ring 6.12 Lokprep 6.13 Connection with water source
7. Pre-testing procedure	7.1 Visual inspection of the unit with power off 7.2 Interview of customer re-history of unit 7.3 Psychrometer and Hygrometer graph/data 7.4 Operate the unit according to manual to confirm defects
8. Components of Electrical Circuit	8.1. Compressor 8.2. Condenser 8.3. Expansion device 8.4. Evaporator 8.5. Filter / drier 8.6. Fan motors 8.7. Receiver 8.8. Accumulator 8.9. Oil separator 8.10. Heating elements
9. Components of refrigeration system	9.1. Compressor 9.2. Condenser 9.3. Expansion device 9.4. Evaporator

	9.5. Filter / drier 9.6. Fan motors 9.7. Receiver 9.8. Accumulator 9.9. Oil separator
10. Test & Check	10.1 Continuity 10.2 Mechanical 10.3 Leak test 10.4 Ground / earth test 10.5 Pressure test 10.6 The temperature at specified places, including ambient Temperature 10.7 Current drawn while running 10.8 Current drawn on starting
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, and recent and meet the requirements of the current version of the Unit of Competency	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Applied safety rules and procedures 1.2 Selected appropriate processes, tools, materials, and equipment based on job requirements 1.3 Identified faults and defects in accordance with standard testing procedures and documented the problem 1.4 Evacuated system using vacuum pump 1.5 Recovered refrigerant and stored in recovery cylinder 1.6 Charged refrigerant by using weighing scale 1.7 Operated the unit and checked to ensure satisfactory performance
2. Underpinning Knowledge	2.1. Refrigeration cycle 2.2. Single and 3 phase electrical power supply system 2.3. Control power 2.4. Specification of the appliance 2.5. Fault finding procedures and probable solution 2.6. Retrofit 2.7. Evacuation procedure 2.8. Method of charging of refrigerants 2.9. Procedure of testing performance
3. Underpinning Skills	3.1. Checking power supply and electrical/electronic circuits and correct faults 3.2. Measuring electrical parameters 3.3. Cutting, bending, swaging, and flaring of tubes 3.4. Welding and brazing 3.5. Selection of correct refrigerant 3.6. Evacuating & charging of refrigeration systems 3.7. Detection and repair leaks 3.8. Charging of refrigerants and commissioning of Ice cream

	maker 3.9. Retrofit 3.10. Testing performance and adjusting controlling components of Ice cream maker
4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Tools and equipment appropriate for work activities 5.3. Materials for work activities
6. Methods of Assessment	Methods of assessment may include but not limited to: 6.1 Written test 6.2 Demonstration 6.3 Oral questioning 6.4 Portfolio
7. Context of Assessment	7.1. Competency assessment must be done in NSDA accredited assessment centre 7.2. Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	OURAC002L3V1: Service and Maintain Mobile Refrigeration Plant
Nominal Hours	**60 Hours**
Unit Descriptor	This unit covers the knowledge, skill and attitude required to service and maintain mobile refrigeration plant in the workplace. It specifically includes the tasks of taking preparation for servicing, checking and testing mobile refrigeration plant and repairing mobile refrigeration plants.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Prepare for Servicing	1.1 Appropriate **PPE** is selected and used in line with job requirements; 1.2 **Work instructions** are interpreted to determine job requirements; 1.3 **Tools and equipment** are selected in accordance with job requirements; 1.4 Repairing instruments are calibrated as per work requirement; 1.5 Necessary **materials** are selected as per job requirement;
2. Check and Test Mobile refrigeration plants	2.1 Mobile refrigeration plant is checked to identify fault according to standard set procedures; 2.2 All **components of the electrical and electronic circuit** are checked according to standard set procedures; 2.3 Compressor are checked and isolated as specified for the unit; 2.4 Body, cabinet, and thermal insulation are checked and restored to the required condition; 2.5 Leak testing are performed to identify leakage of the unit as per standard set procedure; 2.6 All **components** of the refrigeration cycle are checked according to manufactures specifications; 2.7 Faults are identified and tested for final checking;
3. Repair mobile refrigeration plants	3.1 System is evacuated using vacuum pump, recovered refrigerant stored in the cylinder by recovery unit; 3.2 Refrigerant is charged by weight using specified equipment according to specifications; 3.3 Cabinet lamp, temperature controller, heating elements and door gasket are checked and serviced/replaced where necessary to ensure proper functioning; 3.4 Unit is operated and checked according to manufactures specifications;

	3.5 Evaporating and condensing unit along with fins are cleaned; 3.6 Cleaning of unit is performed in accordance with standard procedures;
4. Clean and store of tools and equipment	4.1 Tools and equipment are maintained and cleaned as per instruction manual; 4.2 Work place is cleaned in accordance with environmental requirement; 4.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures;
Range of Variables	
Variables	**Range** (Not limited to):
1. PPE	1. 1 Hand gloves 1. 2 Mask 1. 3 Safety Shoes 1. 4 Apron 1. 5 Safety Goggles 1. 6 Helmet
2. Work instructions	2. 1 Manufacturer's recommendations/specifications 2. 2 Installation drawings 2. 3 Component's instructions
3. Tools	3. 1 Pliers 3. 2 Screwdriver 3. 3 Hacksaw 3. 4 Torque wrench 3. 5 Adjustable wrench 3. 6 Wire stripper/crimper 3. 7 Swaging tools, 3. 8 Flaring tools 3. 9 Bench Vice 3. 10 Hammer 3. 11 Steel wire brush 3. 12 Tube cutter 3. 13 Tube bender 3. 14 Reamer 3. 15 Allen key set
4. Equipment	4.1 Gas welding equipment 4.2 Multimeter 4.3 Tachometer 4.4 Anemometer 4.5 Clamp on meter 4.6 Leak detector 4.7 Megger tester 4.8 Charging station

	4.9 Weighing scale 4.10 Two stage rotary type vacuum pump 4.11 Gauge manifold with hose pipe 4.12 Digital temperature meter
5. Materials	5.1 Fittings 5.2 Elbow 5.3 Copper T- socket 5.4 Brass union 5.5 Reducing unit 5.6 Brass T 5.7 Liquid CO_2 cylinder 5.8 Dry Ice 5.9 Refrigerants 5.10 Dry nitrogen 5.11 Charging nipple 5.12 Copper tube 5.13 Aluminum tube 5.14 Filler rod 5.15 Welding flux 5.16 Filter drier/Strainer 5.17 Thermostatic expansion device 5.18 Lubricating oil
6. Components	6.1 Compressor oil seal 6.2 Discharge service valve 6.3 Suction service valve 6.4 Oil indicator 6.5 Oil separator 6.6 Belt with fly wheel
7. Components of Electrical and electronic Circuit	7.1 Temperature controller 7.2 Low Pressure cut-out 7.3 High Pressure cut-out 7.4 Condenser fan 7.5 Evaporator fan 7.6 Alternator 7.7 Programmable Logic Controller (PLC) 7.8 Power supply
8. Test & Check	8.1. Thermal Insulation 8.2. Mechanical 8.3. Continuity 8.4. Timing Sequence 8.5. Leak 8.6. Ground / earth test 8.7. Current drawn while running 8.8. Current drawn on starting

Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, and recent and meet the requirements of the current version of the Unit of Competency	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Applied safety rules and procedures 1.2 Checked and Identified faults and defects. 1.3 Serviced and maintain mobile refrigeration plant as per identified faults 1.4 Operated units and checked to ensure satisfactory performance
2. Underpinning Knowledge	2.1. Refrigeration cycle 2.2. Single and 3 phase electrical power supply system 2.3. DC power source 2.4. Types of tools, testing & measuring instruments used in Mobile refrigeration plant 2.5. Type of refrigerants and their application
3. Underpinning Skills	3.1. Interpretation of measurements, manufacturer's manuals, specifications 3.2. Checking power supply and electrical/electronic circuits 3.3. Measuring voltage and current using electrical test equipment 3.4. Cutting, bending, swaging, and flaring of tubes 3.5. Welding and brazing 3.6. Selection of correct type of refrigerant 3.7. Evacuating & charging of refrigeration systems 3.8. Detection and repair of refrigerant leaks 3.9. Charging of refrigerants and commissioning of mobile refrigeration plant 3.10. Checking, repairing, and sealing
4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Workplace (simulated or actual) 5.2 Tools and equipment appropriate for work activities 5.3 Materials for work activities
6. Methods of Assessment	Methods of assessment may include but not limited to: 6.1 Written test 6.2 Demonstration 6.3 Oral questioning 6.4 Portfolio

7. Context of Assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre 7.2 Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	OURAC003L3V1: Service and Maintain Transport Refrigeration and Air Conditioning Unit
Nominal Hours	60 Hours
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to service and maintain transport refrigeration and air conditioning units of trucks and vans. It specifically includes tasks of preparing for maintenance activities, Inspecting, and adjusting transport refrigeration accessories, controls and operating conditions, maintaining lubricant system, refrigeration system and air distribution system.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Prepare for maintenance activities	1.1 **PPE** is followed and OSH is observed according to established operating standards; 1.2 **Work instructions** are read interpreted to determine job requirements; 1.3 Appropriate manufacturer's manual or ASHRAE code of practice is consulted; 1.4 **Tools** and **equipment** are selected in accordance with job requirements;
2. Inspect and adjust transport refrigeration accessories, controls, and operating conditions	2.1 **Control Settings** are checked and adjusted as per industry standard; 2.2 **Transport Refrigeration Accessories** are tuned or controlled based on requirement and standard from manufacturer; 2.3 The maintenance of whole system is applied as per ASHRAE code standard;
3. Maintain lubrication system	3.1 Records of previous maintenance is checked and verified based on established maintenance procedure; 3.2 Lubrication system variables and components are checked and adjusted based on manufacture's maintenance manual; 3.3 **Oil parameters** are checked and adjusted based on manufacturer's specification; 3.4 Oil leaks and restrictions are detected and rectified based on manufacturer's maintenance manual; 3.5 Used oil is disposed properly according to ASHRAE code of practice;
4. Maintain refrigeration system	4.1 Evaporator/condenser unit are cleaned according to manufactures standard; 4.2 Tubing's and fittings of refrigerant are checked for **abnormal conditions** based on manufactures standard; 4.3 **Parameters** are measured and analyzed based on manufacturer's maintenance manual;

	4.4 Pressure and temperature drops are checked and recorded based on industry requirement; 4.5 Refrigerant leak test is performed based on industry standard; 4.6 **Transport refrigeration components, accessories and consumables** are inspected in accordance with industry standard;
5. Maintain air distribution system	5.1 **Air distribution system** components are checked and air flow rates are balanced; 5.2 Air supply systems are checked and maintained to meet operational and regulatory requirements;
Range of Variables	
Variables	**Range** (may include but not limited to):
1. PPE	1.1 Hand gloves 1.2 Safety Shoes 1.3 Mask 1.4 Apron 1.5 Helmet
2. Tools	2.1. Pliers 2.2. Screwdriver 2.3. Hacksaw 2.4. Wrenches 2.5. Wire stripper/crimper 2.6. Swaging tools, 2.7. Flaring tools 2.8. Bench Vice 2.9. C Clamp Hammer 2.10. Steel wire brush 2.11. Tube cutter 2.12. Tube bender 2.13. Block vice 2.14. Reamer 2.15. Allen key set
3. Equipment	3.1. Gas welding equipment 3.2. Multimeter 3.3. Clamp on meter 3.4. Electronic leak detector 3.5. Charging station 3.6. Weighing scale 3.7. Two stage rotary type vacuum pumps 3.8. Dry nitrogen cylinder 3.9. Two stage regulators 3.10. Digital temperature meter 3.11. Recovery and recycling unit
4. Materials	4.1 Refrigerants 4.2 Dry nitrogen

	4.3 Charging nipple 4.4 Copper tube 4.5 Filler rod 4.6 Welding flux 4.7 Filter drier/Strainer 4.8 Capillary tube 4.9 Lubricating oil 4.10 Copper and brass fittings 4.11 Flexible cable 4.12 Tab female connector 4.13 Insulation tape 4.14 Hose clamp 4.15 Non return valve/ process tube
5. Work Instructions	5.1 Job permits 5.2 Job orders 5.3 Diagrams/blueprints
6. Control Settings	6.1 Pressures 6.2 Temperatures 6.3 Voltages 6.4 Current draws 6.5 Air Flow 6.6 Noise Level 6.7 Vibrations 6.8 Revolution Per Minute (RPM) 6.9 Frequency
7. Transport Refrigeration Accessories	7.1 Pressure switch 7.2 Temperature controller 7.3 Pulley alignment/belt tension 7.4 Unloader 7.5 Fan blades/blower 7.6 Motors 7.7 Heating elements 7.8 Timer 7.9 Crankcase heater 7.10 Solenoid valve 7.11 Oil Failure Switch
8. Oil Parameters	8.1. Oil Levels 8.2. Oil properties 8.3. Purity of oil 8.4. Viscosity
9. Abnormal Conditions	9.1. Leaks 9.2. Insulation cracks 9.3. Looseness of supports/brackets/fittings 9.4. Vibrations 9.5. Knocking

	9.6. Pinch
10. Parameters	10.1 Operating temperature 10.2 Superheat 10.3 Pressure 10.4 Oil Level 10.5 Voltage 10.6 Current 10.7 Air flow velocity 10.8 Sound level and vibration
11. Transport refrigeration components, accessories, and consumables	11.1 Expansion valves 11.2 Solenoid valves 11.3 Evaporator 11.4 Compressor 11.5 Condenser 11.6 Sight glass 11.7 Oil separator 11.8 Accumulator 11.9 Liquid Receiver 11.10 Oil 11.11 Refrigerant 11.12 Filter Drier/strainer
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, and recent and meet the requirements of the current version of the Unit of Competency	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Checked and adjusted transport refrigeration equipment accessories, controls, and operating conditions 1.2 Applied maintenance procedures according to manufacturer's maintenance manual 1.3 Checked and maintained lubrication system in transport refrigeration 1.4 Checked and maintained refrigeration system in transport refrigeration 1.5 Checked and maintained air-distribution system in transport refrigeration
2. Underpinning Knowledge	2.1 Types of refrigeration oil and characteristics 2.2 Refrigeration lubrication system 2.3 Oil pressure failure switches and controls 2.4 Safety in handling oil and lubricants 2.5 Types of Evaporators, parts, and functions 2.6 Tube processing operations 2.7 Compressor assembly functions, proper belt functions 2.8 Reading and use of measuring instruments 2.9 Refrigerant leakage 2.10 Fan motor assembly

	2.11 Understanding schematic diagram 2.12 Different defects of fan motor and blower 2.13 Methods of maintaining fan motors and blowers 2.14 Housekeeping
3. Underpinning Skills	3.1 Identifying, adding, adjusting, and setting oil pressure controls 3.2 Handling and disposal of used oil 3.3 Assembling and disassembling of evaporator and condenser assembly, checking and cleaning of fins 3.4 Tube cutting, flaring, swaging, and bending 3.5 Measuring operating parameters 3.6 Checking procedures of magnetic clutch 3.7 Adjusting and aligning of belts and pulley 3.8 Locating leakage on tubing and fittings 3.9 Interpretation of schematic diagram 3.10 Dismantling and assembling fan motor and blower 3.11 Determining defects of fan motors and blower 3.12 Cleaning and oiling fan 3.13 Determining compressor defects, repair, and replacement
4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Work place location (simulated or actual) 5.2 Tools and equipment appropriate to maintaining transport refrigeration system 5.3 Materials relevant to the activity 5.4 Drawings and specifications relevant to the task
6. Methods of Assessment	Methods of assessment may include but not limited to: 6.1 Written test 6.2 Demonstration 6.3 Oral questioning 6.4 Portfolio
7. Context of Assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre 7.2 Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	OURAC004L3V1: Operate and Maintain Water Chiller Unit
Nominal Hours	**60 Hours**
Unit Descriptor	This unit covers the knowledge, skill and attitude required to operate and maintain water chiller in the workplace. It specifically includes the tasks of preparing for operation and maintenance, checking the different components, carrying out maintenance and servicing of chiller unit and starting-up & operating the chiller unit.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Prepare for operation and maintenance	1.1 Appropriate **PPE** is selected and used in line with job requirements; 1.2 **Tools and equipment** are selected in accordance with job requirements; 1.3 **Materials** are selected as per job requirement; 1.4 Electrical source of supply is checked and the requirements are verified; 1.5 Availability of continuous supply of good quality water is checked and ensured;
2. Check the different components	2.1 Operational manual and other operational guidelines for operating chiller is interpreted and steps to be followed are identified; 2.2 PH value of water treatment plant is to be checked; 2.3 Infill is checked to remove dust; 2.4 Air vent valve and water level of expansion tank checked as per manufacturer's instruction; 2.5 Valves of condensing water and chilled water line are checked as per standard; 2.6 Starting of cooling tower fans is checked and correct operation ensured as per operation manual; 2.7 Performance of chilled water pump and condensing water pump is checked according to manufacturer's specification; 2.8 Crank case heater and sensor assembly is checked; 2.9 **Testing and checking** of other component are carried out as per recommendation of instruction manual;
3. Carryout maintenance and servicing of chiller unit	3.1 **Air side equipment** is activated and necessary maintenance is carried out; 3.2 Servicing of condenser chilled water pumps is carried out in accordance with manufacturer's instructions; 3.3 Fan speed and air velocity is adjusted as per requirement; 3.4 Crank case heater and sensor assembly is replaced if needed;

	3.5 Maintenance of the **components** of water chiller unit is done as necessary according to operation manual;
4. Start-up & operate the chiller unit	4.1 Instructions on starting operations and other operational guide lines are interpreted; 4.2 Steps outlined in manufacturer's guidelines for starting & operating unit, are followed as specified; 4.3 Chiller control panel is checked; 4.4 Condenser fans, is checked to ensure proper performance; 4.5 Unusual noises in condenser fans checked and faults cleared if necessary; 4.6 Main plant started, readings taken at regulator intervals and recorded in log sheets as per operation manual; 4.7 Temperature readings is taken at **selected points of chiller unit** is recorded;
Range of Variables	
Variables	**Range** (may include but not limited to):
1. PPE	1. 1 Hand gloves. 1. 2 Safety Shoes. 1. 3 Apron 1. 4 Safety goggles 1. 5 Helmet 1. 6 Safety harness 1. 7 Mask
2. Tools	2.1 Pliers 2.2 C Clamp 2.3 Screwdriver 2.4 Hammer 2.5 Hacksaw 2.6 Wrenches 2.7 Wire stripper/crimper 2.8 Swaging tools, 2.9 Flaring tools 2.10 Bench Vice 2.11 Steel wire brush 2.12 Tube cutter 2.13 Tube bender 2.14 Block vice 2.15 Reamer 2.16 Ellen key set
3. Equipment	3.1 Gas welding equipment 3.2 Shell and tube type condenser and chiller 3.3 Thermostatic expansion valve 3.4 Water circulating pumps 3.5 Cooling tower 3.6 Air handling unit

	3.7 Fan coil unit 3.8 Operating panel board 3.9 Digital temperature meter 3.10 Multimeter 3.11 Clamp on meter 3.12 Leak detector 3.13 Megger 3.14 Charging station 3.15 Weighing scale 3.16 Two stage vacuum Pump 3.17 Gauge Manifold with hose pipe 3.18 Semi sealed compressor
4. Materials	4.1 Filler rod 4.2 Electrical cable 4.3 Circuit breaker/switch 4.4 Insulation materials 4.5 Copper tube 4.6 Plastic tubing 4.7 Refrigerants 4.8 Dry nitrogen Charging nipple Welding flux 4.9 Filter drier/Strainer Capillary tube Lubricating oil 4.10 Copper and brass fittings 4.11 Cleaning agent
5. Air side equipment	5.1 Duct 5.2 Grill 5.3 Damper 5.4 Diffuser 5.5 Filter 5.6 Resister 5.7 Fan coil unit (FCU) 5.8 Air handling unit (AHU)
6. Components	6.1 Compressor motor 6.2 Condenser (Forced air, Water cooled) 6.3 Evaporator (Shell and Tube) 6.4 Pressure units 6.5 Refrigerant flow controller 6.6 Electrical controls 6.7 Pipe and fittings. 6.8 Fan motors 6.9 Motor Starter 6.10 Accumulator 6.11 Receiver 6.12 Oil separator 6.13 Filter (core drier) 6.14 Pump 6.15 Cooling tower

	6.16 Water treatment plant 6.17 Air vent 6.18 Infill 6.19 Non return valve 6.20 3-way modulating valve 6.21 Flow meter 6.22 Flow switch 6.23 Manometer/ pitot cell 6.24 Temperature meter 6.25 Y-Strainer 6.26 Water Pressure Gauge 6.27 Flexible joint 6.28 Sensor device (Transducer)
7. Selected points of chiller unit	7.1 Chilled water inlet and outlet 7.2 Condenser inlet and outlet 7.3 Cooling tower inlet and outlet 7.4 Lubricating oil temperature at compressor
8. Test & Check	8.1. Insulation resistance 8.2. Continuity 8.3. Timing Sequence 8.4. Leak 8.5. Grounding test 8.6. Motor Terminal 8.7. Current drawn while running 8.8. Current drawn on starting 8.9. Water P^H value 8.10. Water hardness
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, and recent and meet the requirements of the current version of the Unit of Competency	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Applied safety rules and procedures. 1.2 Checked and Identified faults and defects in accordance with testing procedures. 1.3 Checked and ensured electrical power supply and availability of continuous supply of good quality water 1.4 Serviced components for proper operation 1.5 Operated units and checked to ensure satisfactory performance

2. Underpinning Knowledge	2.1 Refrigeration cycle 2.2 Basic principles of electrical/electronic Single and 3 phase electrical power supply 2.3 Types of tools, testing & measuring instruments used in chiller unit 2.4 Type of refrigerants and their applications 2.5 Testing procedure of water for P^H value and hardness.
3. Underpinning Skills	3. 1 Interpretation of manufacturer manuals and specifications 3. 2 Checking power supply and electrical/electronic circuits 3. 3 Measuring voltage and current using electrical test equipment 3. 4 Cutting, bending, swaging, and flaring of tubes 3. 5 Welding and brazing 3. 6 Selection of correct type of refrigerant 3. 7 Evacuating & charging of refrigeration systems 3. 8 Detection and repair of gas leaks 3. 9 Commissioning of Chiller unit 3. 10 Servicing the necessary components for proper operation. 3. 11 Applying performance testing techniques and adjusting chiller unit
4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Tools and equipment appropriate for work activities 5.3. Materials for work activities
6. Methods of Assessment	Methods of assessment may include but not limited to: 6.1. Written test 6.2. Demonstration 6.3. Oral questioning 6.4. Portfolio
7. Context of Assessment	7.1. Competency assessment must be done in NSDA accredited assessment centre 7.2. Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	OURAC005L3V1: Perform Refrigerant Recovery, Re-Cycling and Retrofitting
Nominal Hours	**30 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform refrigerant recovery, re-cycling and retrofitting in the workplace. It specifically includes the tasks of preparing for recovery and recycling, assessing unit for recovery and recycling, performing refrigerant recovery, flashing for retrofitting, and retrofitting refrigerant.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Prepare for recovery and recycling	1.1 Appropriate **PPE** is selected and used in line with job requirements; 1.2 Work instructions are interpreted to determine job requirements; 1.3 Necessary **Tools and equipment** are selected and gathered in accordance with job requirements; 1.4 Equipment, instruments, and tools are checked for serviceability; 1.5 Equipment, instruments, tools, and accessories are set-up according to manufacturer's recommendations;
2. Assess unit for recovery and recycling	2.1 Unit is assessed for recovery based on job requirements; 2.2 Appropriateness of unit for refrigerant recovery is determined according to the requirements and manufacturer's specifications; 2.3 Appropriateness of unit for refrigerant recycling is determined according to the requirements and manufacturer's specifications;
3. Perform refrigerant recovery	3.1 Pipe is connected accordingly with recovery machine and pressure gauges; 3.2 Uses of filter is ensured as per requirement; 3.3 Purging is performed as per manufacturer's standard; 3.4 Recovery is performed as per manufacturer's standard; 3.5 **Contaminants** are removed from the system as per standard procedures; 3.6 Recovery machine is operated and maintained in accordance with manufacturer's recommendations;

4. Flash for retrofitting	4.1 Baseline data is recorded based on original and current system performance; 4.2 CFC Refrigerant charge is Isolated from the system by using a pump/recovery machine based on ASHRAE standard; 4.3 Compressor lubricant is drained and selected a polyol ester lubricant as per compressor manufacturer's suggestion; 4.4 Gasket and seal of compressor is changed and recharged the same volume of HFC/HC-compatible lubricant as the volume drained; 4.5 System is charged with dry nitrogen as per standard procedure; 4.6 **Flashing** the System is continued until the residual mineral oil or Alkyl benzene content is below 5%;
5. Retrofit refrigerant	5.1 Expansion device is checked and adjusted as necessary; 5.2 Filter drier is replaced with new filter drier approved for use with the newly charged alternative refrigerant; 5.3 The system is reconnected and evacuated as per standard procedure; 5.4 System is recharged with the alternative refrigerant as per ASHRAE guidelines; 5.5 System operation is checked and adjusted charges to achieve desired operating condition;
Range of Variables	
Variables	**Range** (may include but not limited to):
1. PPE	1.1 Hand gloves. 1.2 Safety Shoes. 1.3 Apron 1.4 Safety goggles 1.5 Helmet 1.6 Safety harness 1.7 Mask
2. Tools	2. 1 Pliers 2. 2 Screwdriver 2. 3 Hacksaw 2. 4 Wrenches 2. 5 Wire stripper/crimper 2. 6 Swaging tools 2. 7 Flaring tools 2. 8 C Clamp 2. 9 Hammer

	2. 10 Steel wire brush 2. 11 Tube cutter 2. 12 Tube bender 2. 13 Block vice 2. 14 Reamer 2. 15 Ellen key set
3. Equipment	3.1 Multimeter 3.2 Clamp on meter 3.3 Weighing scale 3.4 System analyzer 3.5 Recovery machine 3.6 Vacuum Pump 3.7 Recycling machine 3.8 Refrigerant recovery cylinder 3.9 Gauge manifold with hose pipe 3.10 Thermostat/ Temperature controller 3.11 Relay
4. Manufacturer's recommendations	4.1 Equipment operator's manual 4.2 Equipment service manual 4.3 Name plate data
5. Contaminants	5.1 Acid 5.2 Moisture 5.3 Foreign particles e.g., chips, burr 5.4 Non-condensable gases
6. Flashing	Flashing consists of repetition of the following process: 6.1 Drain the Lubricant 6.2 Measure existing lubricant 6.3 Recharge compressor with replacement lubricant 6.4 Flashing with nitrogen 6.5 Reinstall the compressor 6.6 Recharge the refrigerant 6.7 Run the compressor
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, and recent and meet the requirements of the current version of the Unit of Competency	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Applied safety rules and procedures 1.2 Prepared components and required tools and equipment properly 1.3 Performed refrigerant recycling, complying with manufacturer's recommendations 1.4 Achieved optimum refrigerant recovery 1.5 Took necessary action to rectify fault 1.6 Performed retrofitting

2. Underpinning Knowledge	2.1. Recovery procedures and standards 2.2. Recycling procedures and standards 2.3. Ozone-layer depletion and its effects 2.4. Clean Air Act (Green House Effect from CFC, HCFC, HFC) 2.5. Recovery equipment specifications, parts and uses 2.6. Recycling equipment specifications, parts and uses 2.7. Refrigerant identifier instrument, specification, parts and uses
3. Underpinning Skills	3.1. Installing and operating recovery and recycling machine 3.2. Interpreting manufacturer and equipment data 3.3. Applying safety precautions in handling refrigerants 3.4. Maintaining techniques of using recovery/recycling machine 3.5. Using of refrigerant identifier 3.6. Apply the process of retrofitting of refrigerant.
4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Tools and equipment appropriate for work activities 5.3. Materials for work activities
6. Methods of Assessment	Methods of assessment may include but not limited to: 6.1 Written test 6.2 Demonstration 6.3 Oral questioning 6.4 Portfolio
7. Context of Assessment	7.1. Competency assessment must be done in NSDA accredited assessment centre 7.2. Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Copyright

This Competency Standard for **"Refrigeration and Airconditioning" NTVQF L- 3** is a document for the development of curricula, teaching and learning materials, and assessment tools. It also serves as the document for providing training consistent with the requirements of industry in order for individuals who graduated through the established standard via competency-based assessment to be suitably qualified for a relevant job.

This document is owned by the National Skills Development Authority (NSDA) of the People's Republic of Bangladesh, developed in association with **Light Engineering Industry Skills Council (LEISC)**.

Public and private institutions may use the information contained in this standard for activities benefitting Bangladesh.

Other interested parties must obtain permission from the owner of this document for reproduction of information in any manner, in whole or in part, of this Competency Standard, in English or other language.

This document is available from:

National Skills Development Authority (NSDA)
423-428 Tejgaon Industrial Area, Dhaka-1215
Phone: +880 2 8891091; Fax: +880 2 8891092;
E-mail: ecnsda@nsda.gov.bd
Website: www.nsda.gov.bd