



**COMPETENCY STANDARD**  
**FOR**  
**Refrigeration and Air Conditioning**  
**(Light Engineering Sector)**

**Level: 2**

Competency Standard Code: LECS0005L2V1

**National Skills Development Authority**  
**Prime Minister's Office, Bangladesh**

## Contents

Introduction .....	3
Overview .....	4
List of Abbreviations .....	6
Approval of Competency Standard .....	7
Course Structure .....	8
Units & Elements at a glance.....	9
The Generic Competencies .....	12
Unit Code and Title.....	13
GU008L2V1: Work in a Team Environment.....	13
The Occupation Specific Competencies .....	15
<b>OURAC001L2V1: Service and Repair Window Type Air Conditioners .....</b>	<b>16</b>
<b>OURAC002L2V1: Service and Repair Split Type Air Conditioners .....</b>	<b>21</b>
<b>OURAC003L2V1: Install Window and Split Type Air Conditioners .....</b>	<b>26</b>
<b>OURAC004L2V1: Install, Service and Repair Display Case Freezer .....</b>	<b>31</b>
<b>OURAC005L2V1: Repair and Maintain Humidifier and De-humidifier .....</b>	<b>36</b>
<b>OURAC006L2V1: Service and Maintain Dispensing Unit and Bottle Coolers ...</b>	<b>41</b>
Development of Competency Standard by Technical Sub-Committee (TSC) .....	46
Validation of Competency Standard by Standard and Curriculum Validation Committee (SCVC).....	47

## 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 program. **Refrigeration and Air Conditioning** 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 students enrolled in TVET. Students 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 guides

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
<p style="text-align: center;">6 Mid-Level Manager/ Sub Assistant Engineer</p>	<p>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.</p>	<p>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.</p>	<p>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.</p>
<p style="text-align: center;">5 Supervisor</p>	<p>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.</p>	<p>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.</p>	<p>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.</p>
<p style="text-align: center;">4 Highly Skilled Worker</p>	<p>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.</p>	<p>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.</p>	<p>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.</p>
<p style="text-align: center;">3 Skilled Worker</p>	<p>Moderately broad knowledge in a specific work or study area, able to perceive ideas and abstract from drawing and design according to workplace requirements.</p>	<p>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</p>	<p>Work or study under supervision with considerable autonomy. Participate in teams and responsible for group coordination.</p>
<p style="text-align: center;">2 Semi-Skilled Worker</p>	<p>Basic understanding of underpinning knowledge in a specific work or study area, able to interpret and apply common occupational terms and instructions.</p>	<p>Skills required to carry out simple tasks, communicate with his team in the workplace presenting and discussing results of his work with required clarity.</p>	<p>Work or study under supervision in a structured context with limited scope of manipulation</p>
<p style="text-align: center;">1 Basic Skilled Worker</p>	<p>Elementary understanding of ability to interpret the underpinning knowledge in a specific study area, able to interpret common occupational terms and instructions.</p>	<p>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.</p>	<p>Work under direct supervision in a structured context with limited range of responsibilities.</p>

## **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

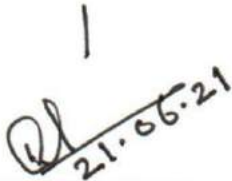
**PPE** – Personal Protective Equipment

**SOP** – Standard Operating Procedures

## Approval of Competency Standard

### Members of the Approval Committee:

Member	Signature
<b>Dulal Krishna Saha</b> Executive Chairman (Secretary) National Skills Development Authority (NSDA)	 21.06.21
<b>Md. Nurul Amin</b> Member (Admin & Finance) And Member (Registration & Certification) Joint Secretary National Skills Development Authority (NSDA)	 21.06.21
<b>Alif Rudaba</b> 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 –2 in  
Refrigeration and Air Conditioning  
(Light Engineering Sector)**

**Course Structure**

SL	Unit Code and Title		UoC Level	Nominal (Hours)
<b>The Generic Competencies</b>				<b>20</b>
1	GU008L2V1	Work in a team environment	2	20
<b>The Sector Specific Competencies</b>				
<b>The Occupation Specific Competencies</b>				<b>240</b>
1	OURAC001L2V1	Service and Repair Window Type Air-Conditioners	2	40
2	OURAC002L2V1	Service and Repair Split Type Air-Conditioners	2	60
3	OURAC003L2V1	Install Window and Split Type Air-Conditioners	2	40
4	OURAC004L2V1	Install, Service and Repair Display Freezer	2	40
5	OURAC005L2V1	Repair & Maintain Residential Humidifiers & De-Humidifiers	2	30
6	OURAC006L2V1	Service & Maintain Dispensing Unit & Bottle Cooler	2	30
<b>Total Nominal Learning Hours</b>				<b>260</b>



## Units & Elements at a glance

### The Generic Competencies

Code	Unit of Competency	Elements of Competency	Duration (Hours)
GU008L2V1	Work in a team environment	<ol style="list-style-type: none"><li>1. Define team role and scope</li><li>2. Identify individual role and responsibility</li><li>3. Participate in team discussions</li><li>4. Work as a team member</li></ol>	20

## The Occupation Specific Competencies

Code	Unit of Competency	Elements of Competency	Duration (Hours)
OURAC001L2V1	Service and Repair Window Type Air Conditioners	<ol style="list-style-type: none"> <li>1. Prepare unit, tools and workplace</li> <li>2. Check and identify defects</li> <li>3. Repair window type Air Conditioners</li> <li>4. Clean and store of tools and equipment</li> </ol>	40
OURAC002L2V1	Service and Repair Split Type Air Conditioners	<ol style="list-style-type: none"> <li>1. Prepare unit tools and workplace</li> <li>2. Check and identify defects</li> <li>3. Repair split type Air Conditioners</li> <li>4. Clean and store of tools and equipment</li> </ol>	60
OURAC003L2V1	Install Window and Split Type Air Conditioners	<ol style="list-style-type: none"> <li>1. Prepare for installation</li> <li>2. Perform cavity works</li> <li>3. Install window type air-conditioning unit</li> <li>4. Install split type air conditioner</li> <li>5. Set refrigerant line and make electrical connection for split type air conditioner</li> <li>6. Clean and store of tools and equipment</li> </ol>	40
OURAC004L2V1	Install, Service and Repair Display Freezer	<ol style="list-style-type: none"> <li>1. Prepare for Repairing</li> <li>2. Install display freezer</li> <li>3. Check and Test Display Freezer</li> <li>4. Repair display freezer</li> <li>5. Clean, maintain workplace tools and equipment</li> </ol>	40

OURAC005L2V1	Repair and Maintain Humidifier and De-humidifier	<ol style="list-style-type: none"> <li>1. Prepare for repairing</li> <li>2. Check and Identify faults</li> <li>3. Maintain and repair Humidifier</li> <li>4. Maintain and repair Dehumidifier</li> <li>5. Clean and store tools and equipment</li> </ol>	30
OURAC006L2V1	Service and Maintain Dispensing Unit and Bottle Coolers	<ol style="list-style-type: none"> <li>1. Prepare for Repairing</li> <li>2. Check and Test water coolers</li> <li>3. Check and Test dispensing unit</li> <li>4. Repair water cooler</li> <li>5. Repair dispensing unit</li> <li>6. Perform routine maintenance, clean and store tools, and equipment</li> </ol>	30

## **The Generic Competencies**

<b>Unit Code and Title</b>	<b>GU008L2V1: Work in a Team Environment</b>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitudes (KSAs) required to work in a team environment. It includes defining team role and scope, identifying individual role and responsibility. Participating in team discussions and working as a team member.
<b>Nominal Hours</b>	<b>20 Hours</b>
<b>Elements of Competency</b>	<b>Performance Criteria</b> <b><u>Bold &amp; Underlined</u></b> terms are elaborated in the Range of Variables
1. Define team role and scope	1.1. Role and objectives of the team are defined; 1.2. Team structure, responsibilities and reporting relations are identified from team discussions and other external sources;
2. Identify individual role and responsibility	2.1 Individual roles and responsibilities of <b><u>team members</u></b> are identified; 2.2 Reporting relationships among team members are defined and clarified; 2.3 Reporting relationships external to the team are defined and clarified;
3. Participate in team discussions	3.1 Ideas related to team plans are contributed; 3.2 Recommendations for improving team work are put forward;
4. Work as a team member	4.1. Effective forms of communication are used to interact with team members; 4.2. Communication channels are followed; 4.3. OHS practices are followed;
<b>Range of Variables</b>	
<b>Variables</b>	<b>Range</b> (may include but not limited to):
1. Sources of information	1.1 Standard Operating Procedures 1.2 Job Description 1.3 Operations Manual 1.4 Organizational Structure
2. Team Members	2.1. Coach/mentor 2.2. Supervisor/Manager 2.3. Peers/Colleagues 2.4. Employee representative
3. Workplace context	3.1 National Laws and Statutes 3.2 Standard Operating Procedures 3.3 Workplace Rules and Regulations
<b>Evidence Guide</b>	
The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 demonstrated knowledge in working in a team environment. 1.2 satisfied the requirements mentioned in the

	Performance Criteria and Range of Variables
2. Underpinning knowledge	2.1 Team Structure, Role and Responsibility 2.2 Individual Members' Roles and Responsibilities 2.3 Communication Flow and Reporting Structures 2.4 Team Planning 2.5 Interpersonal Communication Skills 2.6 Team Meeting Procedures 2.7 OHS Practices
3. Underpinning skills	3.1 Identifying the role and responsibility of the team 3.2 Identifying roles and responsibilities of individual members 3.3 Participating in team discussions 3.4 Working as a team member
4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect for rights of peers and seniors in workplace 4.6 Communication with peers and seniors in Workplace
5. Resource implications	5.1 Pens 5.2 Telephone 5.3 Computer 5.4 Writing materials 5.5 Online communication
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1. Workplace observation 6.2. Demonstration 6.3. Oral questioning 6.4. Written test 6.5. Portfolio
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment center 7.2 Assessment should be done by a NSDA certified/nominated assessor
<b>Accreditation Requirements</b> 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.	

## **The Occupation Specific Competencies**

<b>Unit Code and Title</b>	<b>OURAC001L2V1: Service and Repair Window Type Air Conditioners</b>
<b>Nominal Hours</b>	<b>40 Hours</b>
<b>Unit Descriptor</b>	This unit covers the knowledge, skill and attitude required to service and repair window type air conditioners in the workplace. It specifically includes the tasks of preparing unit, tools and workplace, checking and identifying defects and repairing window type air conditioners.
<b>Elements of Competency</b>	<b>Performance Criteria</b> <b>Bold and Underlined</b> terms are elaborated in the Range of Variables.
1. Prepare unit, tools and workplace	<p>1.1 Personal protective equipment (<b>PPE</b>) is used and OSH is followed;</p> <p>1.2 Work instructions are interpreted to determine job requirements;</p> <p>1.3 <b>Tools and equipment</b> are selected in accordance with job requirements;</p> <p>1.4 Measuring and repairing instruments are calibrated as per work requirement;</p> <p>1.5 <b>Materials</b> are selected as per job requirement;</p>
2. Check and identify defects	<p>2.1 Systematic <b>pre-testing procedure</b> is observed in accordance with manufacturer's instructions;</p> <p>2.2 All components of the air-flow system checked according to manufactures specifications to ensure correct performance;</p> <p>2.3 Motor terminals are checked using specified testing procedures;</p> <p>2.4 Control settings/adjustments are checked in conformity with service- manual specifications;</p> <p>2.5 All <b>components</b> of refrigeration and <b>electrical</b> / electronic circuit are checked according to standard procedures;</p> <p>2.6 System defects/fault symptoms are identified and documented using appropriate tools and equipment;</p>
3. Repair window type Air Conditioners	<p>3.1 Defective parts/components are replaced;</p> <p>3.2 Control settings and adjustments are performed in conformity with service- manual specifications;</p> <p>3.3 System is evacuated and recovered refrigerant is stored;</p> <p>3.4 Refrigerant is recharged using specified type of refrigerant;</p> <p>3.5 Cleaning of unit is performed in accordance with standard procedures;</p> <p>3.6 Unit is operated and <b>tested &amp; checked</b> to ensure</p>



	satisfactory performance; 3.7 Report on repair is prepared in line with company 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;
<b>Range of Variables</b>	
<b>Variables</b>	<b>Range (may include but not limited to):</b>
1. PPE	1. 1 Hand gloves 1. 2 Safety Shoes 1. 3 Apron 1. 4 Safety Goggles 1. 5 Helmet 1. 6 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 Bench Vice 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. Capacitor tester 3.4. Leak detectors 3.5. Gas welding equipment 3.6. Gauge manifold 3.7. Two stage Vacuum pump 3.8. Refrigerant recovery machine
4. Materials	4.1 Charging nipple 4.2 refrigeration fittings 4.3 Refrigerants 4.4 Copper tube 4.5 Welding filler rod 4.6 Welding flux

	<ul style="list-style-type: none"> <li>4.7 Strainer</li> <li>4.8 Capillary tube</li> <li>4.9 Lubricating oil.</li> <li>4.10 Copper and brass fittings</li> <li>4.11 Recovery cylinder</li> </ul>
5. Pre-testing procedure	<ul style="list-style-type: none"> <li>5.1 Visual inspection of the unit with power off</li> <li>5.2 Interview of customer re-history of unit</li> <li>5.3 Psychrometer and Hygrometer graph/data</li> <li>5.4 Operate the unit according to manual to confirm defects</li> </ul>
6. Components of Electrical and Electronic Circuit	<ul style="list-style-type: none"> <li>6.1 Compressor Motor</li> <li>6.2 Thermostat switch</li> <li>6.3 Relay</li> <li>6.4 Overload protector</li> <li>6.5 Capacitor</li> <li>6.6 Selector switch</li> <li>6.7 Remote controller</li> <li>6.8 Universal AC circuit</li> <li>6.9 Swing motor</li> <li>6.10 Blower fan motor</li> <li>6.11 Variac</li> <li>6.12 Socket</li> <li>6.13 Cables</li> <li>6.14 circuit breaker</li> <li>6.15 Magnetic contactor</li> <li>6.16 Control panel</li> </ul>
7. Components of refrigeration system	<ul style="list-style-type: none"> <li>7.1. Compressor</li> <li>7.2. Condenser</li> <li>7.3. Filter / drier</li> <li>7.4. Expansion device</li> <li>7.5. Evaporator</li> <li>7.6. Pipes and fittings</li> </ul>
8. Test & Check	<ul style="list-style-type: none"> <li>8.1. Insulation</li> <li>8.2. Resistance</li> <li>8.3. Mechanical</li> <li>8.4. Continuity</li> <li>8.5. Leak</li> <li>8.6. Suction, discharge and idle pressure</li> <li>8.7. Starting and running current.</li> <li>8.8. Minimum of 30 minutes, steady vacuum of 29.9 in. Hg(mercury) as per standard</li> </ul>
<p><b>Evidence Guide</b>  The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency</p>	

1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <ol style="list-style-type: none"> <li>1.1 Applied safety rules and procedures</li> <li>1.2 Checked all components of air conditioning and electrical / electronic circuit according to standard procedures</li> <li>1.3 Evacuated the System and recovered refrigerant stored in recovery unit</li> <li>1.4 Performed refrigerant charging in accordance with the manual</li> <li>1.5 Completed repair work as to specifications</li> <li>1.6 Repaired unit is tested before reinstallation</li> </ol>
2. Underpinning Knowledge	<ol style="list-style-type: none"> <li>2.1. Types of electrical controls</li> <li>2.2. Single and 3 phase electrical power supply system</li> <li>2.3. Fault finding procedures</li> <li>2.4. Evacuation procedure</li> <li>2.5. Vapor compression Refrigeration cycle</li> <li>2.6. Refrigerants used in window and split air conditioner</li> </ol>
3. Underpinning Skills	<ol style="list-style-type: none"> <li>3.1. Checking power supply and electrical/electronic circuits and correct faults.</li> <li>3.2. Using testing &amp; measuring instruments.</li> <li>3.3. Proper Handling tools &amp; equipment.</li> <li>3.4. Cutting, bending, swaging and flaring of tubes.</li> <li>3.5. Welding and brazing.</li> <li>3.6. Selection correct type of refrigerant.</li> <li>3.7. Detection and repair of leaks.</li> <li>3.8. Evacuating and charging of refrigerants</li> <li>3.9. Performance testing and adjustments in Window &amp; Split type air conditioners</li> </ol>
4. Underpinning Attitudes	<ol style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Promptness in carrying out activities</li> <li>4.3 Sincere and honest to duties</li> <li>4.4 Environmental concerns</li> <li>4.5 Eagerness to learn</li> <li>4.6 Tidiness and timeliness</li> <li>4.7 Respect for rights of peers and seniors in workplace</li> <li>4.8 Communication with peers and seniors in workplace</li> </ol>
5. Resource Implications	<p>The following resources must be provided:</p> <ol style="list-style-type: none"> <li>5.1 Workplace (simulated or actual)</li> <li>5.2 Tools and equipment appropriate for work activities</li> <li>5.3 Materials for work activities</li> </ol>
6. Methods of Assessment	<p>Methods of assessment may include but not limited to:</p> <ol style="list-style-type: none"> <li>6.1 Written test</li> <li>6.2 Demonstration</li> <li>6.3 Oral questioning</li> <li>6.4 Portfolio</li> </ol>

7. Context of Assessment	<p>7.1 Competency assessment must be done in NSDA accredited assessment centre</p> <p>7.2 Assessment should be done by a NSDA certified/nominated assessor</p>
<p><b>Accreditation Requirements</b></p> <p>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.</p>	

Unit Code and Title	OURAC002L2V1: Service and Repair Split Type Air Conditioners
Nominal Hours	60 Hours
Unit Descriptor	This unit covers the knowledge, skill and attitude required to repair split type air conditioners in the workplace. It specifically includes the tasks of preparing unit, tools and workplace, checking and identifying defects and repairing split type air conditioners.
Elements of Competency	<b>Performance Criteria</b> <b>Bold and Underlined</b> terms are elaborated in the Range of Variables.
1. Prepare unit tools and workplace	1.1 Personal protective equipment ( <b>PPE</b> ) is used and OSH is followed; 1.2 Work instructions are interpreted to determine job requirements; 1.3 Necessary <b>Tools and equipment</b> are selected in accordance with job requirements; 1.4 Measuring and Repairing instruments are calibrated as per work requirement; 1.5 Necessary <b>materials</b> are selected as per job requirement;
2. Check and identify defects	2.1 Systematic <b>pre-testing procedure</b> is observed in accordance with manufacturer's instructions; 2.2 All components of the Air-flow system checked according to manufactures specifications to ensure correct performance; 2.3 Motor terminals are checked using specified testing procedures; 2.4 Control settings/adjustments are checked in conformity with service- manual specifications; 2.5 All <b>components</b> of refrigeration and <b>electrical</b> / electronic circuit are checked according to standard procedures; 2.6 System defects/fault symptoms are identified and documented using appropriate tools and equipment; 2.7 Refrigerant is pumped down to the outdoor unit if required;
3. Repair split type Air Conditioners	3.1 Defective parts/components are replaced with identical or recommended appropriate equivalent ratings; 3.2 Control settings and adjustments are performed in conformity with service- manual specifications; 3.3 System is evacuated using vacuum pump and recovered refrigerant stored in recovery unit according to manufacturer's specifications; 3.4 Refrigerant is recharged using specified type of refrigerant

	<p>by recharging equipment to required specification following safety practices;</p> <p>3.5 Unit is cleaned in accordance with standard procedures;</p> <p>3.6 Unit is operated and <b>tested &amp; checked</b> according to standard procedure;</p> <p>3.7 Report on repair is prepared in line with workplace procedures;</p>
4. Clean and store of tools and equipment	<p>4.1 Tools and equipment are maintained and cleaned as per instruction manual;</p> <p>4.2 Work place is cleaned in accordance with environmental requirement;</p> <p>4.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures;</p>
<b>Range of Variables</b>	
<b>Variables</b>	<b>Range (may include but not limited to):</b>
1. PPE	<p>1. 1 Hand gloves</p> <p>1. 2 Safety Shoes</p> <p>1. 3 Apron</p> <p>1. 4 Safety Goggles</p> <p>1. 5 Helmet</p> <p>1. 6 Mask</p>
2. Tools	<p>2. 1 Pliers</p> <p>2. 2 Screwdriver</p> <p>2. 3 Hacksaw</p> <p>2. 4 Wrenches</p> <p>2. 5 Wire stripper</p> <p>2. 6 Crimper</p> <p>2. 7 Swaging expander</p> <p>2. 8 Flaring tools</p> <p>2. 9 Bench Vice</p> <p>2. 10 C Clamp</p> <p>2. 11 Hammer</p> <p>2. 12 Steel wire brush</p> <p>2. 13 Tube cutter</p> <p>2. 14 Capillary tube cutter</p> <p>2. 15 Tube bender</p> <p>2. 16 Block vice</p> <p>2. 17 Reamer</p> <p>2. 18 Ellen key set</p>
3. Equipment	<p>3.1. Multimeter</p> <p>3.2. Clamp on meter</p> <p>3.3. Capacitor tester</p> <p>3.4. Leak detectors</p> <p>3.5. Megger</p> <p>3.6. Gas welding equipment</p> <p>3.7. Gauge manifold</p>

	3.8. Two stage Vacuum pump
4. Materials	4.1 Charging nipple 4.2 refrigeration fittings 4.3 Refrigerants 4.4 Copper tube 4.5 Welding filler rod 4.6 Welding flux 4.7 Strainer 4.8 Capillary tube 4.9 Lubricating oil. 4.10 Copper and brass fittings
5. Pre-testing procedure	5.1 Visual inspection of the unit with power off 5.2 Interview of customer re-history of unit 5.3 Psychrometer and Hygrometer graph/data 5.4 Operate the unit according to manual to confirm defects
6. Components of Electrical and Electronic Circuits	6.1 Compressor motor 6.2 Overload protector 6.3 Starting relays 6.4 Thermostat switch 6.5 Heaters 6.6 Timers and other related electrical components found in refrigeration electrical systems
7. Components of refrigeration system	7.1. Temperature control 7.2. Compressor motor and relays 7.3. Fan motors 7.4. Refrigerant circuit 7.5. Evaporator 7.6. Condenser, 7.7. Metering device (refrigerant flow controller), 7.8. Filter / drier, 7.9. Tube and fittings.
8. Test & Check	8.1. Insulation 8.2. Resistance 8.3. Mechanical 8.4. Continuity 8.5. Leak 8.6. Suction & discharge pressure 8.7. Water temperature 8.8. Current drawn while running. 8.9. Current drawn on starting
9. Evacuation	9.1. Minimum of 30 minutes, steady vacuum of 29 in. Hg(mercury) unless otherwise specified by the compressor and manufacturer

10. Remove mineral oil	10.1 Removing and draining components 10.2 Flushing using dry nitrogen (DN2)
<p><b>Evidence Guide</b> The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency</p>	
1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Applied safety rules and procedures</li> <li>1.2 All components of air conditioning and electrical / electronic circuit are checked according to standard procedures</li> <li>1.3 System is evacuated and recovered refrigerant stored in recovery unit</li> <li>1.4 Performed refrigerant charging in accordance with the manual</li> <li>1.5 Completed repair work as to specifications</li> <li>1.6 Repaired unit is tested before reinstallation</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1. Types of electrical controls</li> <li>2.2. Single and 3 phase electrical power supply system</li> <li>2.3. Fault finding procedures</li> <li>2.4. Evacuation procedure</li> <li>2.5. Vapor compression Refrigeration cycle</li> <li>2.6. Refrigerants used in window and split air conditioner</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1. Checking power supply and electrical/electronic circuits and correct faults.</li> <li>3.2. Using testing &amp; measuring instruments.</li> <li>3.3. Proper Handling tools &amp; equipment.</li> <li>3.4. Cutting, bending, swaging and flaring of tubes.</li> <li>3.5. Welding and brazing.</li> <li>3.6. Selection correct type of refrigerant.</li> <li>3.7. Detection and repair of leaks.</li> <li>3.8. Evacuating and charging of refrigerants</li> <li>3.9. Performance testing and adjustments in Window &amp; Split type air conditioners</li> </ul>
4. Underpinning Attitudes	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Promptness in carrying out activities</li> <li>4.3 Sincere and honest to duties</li> <li>4.4 Environmental concerns</li> <li>4.5 Eagerness to learn</li> <li>4.6 Tidiness and timeliness</li> <li>4.7 Respect for rights of peers and seniors in workplace</li> <li>4.8 Communication with peers and seniors in workplace</li> </ul>
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>5.1 Workplace (simulated or actual)</li> <li>5.2 Tools and equipment appropriate for work activities</li> <li>5.3 Materials for work activities</li> </ul>



6. Methods of Assessment	<p>Methods of assessment may include but not limited to:</p> <ul style="list-style-type: none"> <li>6.1 Written test</li> <li>6.2 Demonstration</li> <li>6.3 Oral questioning</li> <li>6.4 Portfolio</li> </ul>
7. Context of Assessment	<ul style="list-style-type: none"> <li>7.1 Competency assessment must be done in NSDA accredited assessment centre</li> <li>7.2 Assessment should be done by a NSDA certified/nominated assessor</li> </ul>
<p><b>Accreditation Requirements</b></p> <p>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.</p>	

Unit Code and Title	OURAC003L2V1: Install Window and Split Type Air Conditioners
Nominal Hours	40 Hours
Unit Descriptor	This unit covers the knowledge, skill and attitude required to install window and split type air conditioners in the workplace. It specially includes the tasks of preparing for installation, performing cavity works, installing window and split type air conditioners and setting refrigerant line and electrical connection.
Elements of Competency	<b>Performance Criteria</b> <b>Bold and Underlined</b> terms are elaborated in the Range of Variables.
1. Prepare for installation	1.1 Appropriate <b><u>PPE</u></b> is selected and used in line with job requirements; 1.2 <b><u>Work instructions</u></b> are interpreted to determine job requirements; 1.3 <b><u>Tools and equipment</u></b> are selected in line with job requirements; 1.4 Associated <b><u>materials</u></b> of are selected in accordance with job requirements; 1.5 <b><u>Unit</u></b> and components are prepared based on work procedures;
2. Perform cavity works	2.1 Dimensions of cavity are determined based on work instructions/ plans; 2.2 Cavity area is prepared in line with work instructions/plans; 2.3 Boring/cutting is performed based on cavity dimensions; 2.4 Cavity sides are finished, leveled, plumbed and aligned in line with work instructions and job requirements; 2.5 Dimensions of cavity are checked to ensure that gaps on all sides, except base are less than 3mm; 2.6 Work place is cleaned and kept in safe state in line with work instructions;
3. Install window type air-conditioning unit	3.1 <b><u>Electrical cabling</u></b> and wiring devices of correct load carrying capacity are selected and safely installed in accordance with manufacturer's instructions; 3.2 Unit is <b><u>positioned and leveled</u></b> according to manufacturer's instructions; 3.3 <b><u>Sealant</u></b> is installed to ensure an air tight seal around the unit in as per manufacturer's instructions; 3.4 <b><u>Condensation drain</u></b> is installed to ensure free drainage of condenser and to avoid water spillage; 3.5 Safe manual handling techniques are employed in accordance with enterprise OHS procedures;

	<p>3.6 Work site is cleaned and kept in safe state in accordance with work instructions;</p> <p>3.7 Unit is operated and tested to ensure satisfactory performance according to manufactures specifications;</p>
4. Install split type air conditioner	<p>4.1 Location where air conditioner is to be installed is marked and prepared appropriate for cooling / client's requirements;</p> <p>4.2 Supporting structures to hold air conditioner fixed according to manufacturer's specifications;</p> <p>4.3 Condensing unit/outdoor unit is fixed according to manufacturer's instruction;</p> <p>4.4 Evaporator/indoor unit is fixed according to instruction manual;</p>
5. Set refrigerant line and make electrical connection for split type air conditioner	<p>5.1 Refrigerant lines are connected to condensing/outdoor unit and evaporator/indoor unit with extensions if required;</p> <p>5.2 Refrigerant lines are purged/vacuum as necessary;</p> <p>5.3 Vacuum pressure is tested and charged refrigerant in accordance with instruction manual;</p> <p>5.4 Refrigerant lines insulated as per requirement;</p> <p>5.5 Electrical wiring to both units is installed and connected in accordance with cooling capacity of unit;</p> <p>5.6 System switched on, according to instructional manual and performance of air conditioner checked;</p> <p>5.7 Unusual noises, vibrations etc. checked and defects rectified, as necessary;</p>
6. Clean and store of tools and equipment	<p>6.1. Tools and equipment are cleaned as per instruction manual;</p> <p>6.2. Work place is cleaned in accordance with environmental requirement;</p> <p>6.3. Tools and equipment are stored safely in appropriate location according to standard workshop procedures;</p>
<b>Range of Variables</b>	
<b>Variables</b>	<b>Range (may include but not limited to):</b>
1. PPE	<p>1. 1 Hand gloves.</p> <p>1. 2 Safety Shoes.</p> <p>1. 3 Apron</p> <p>1. 4 Safety goggles</p> <p>1. 5 Helmet</p> <p>1. 6 Safety Rope and belts</p> <p>1. 7 Mask</p>
2. Work instructions	<p>2.1 Manufacturer's recommendations/specifications</p> <p>2.2 Installation drawings</p> <p>2.3 Blueprints</p> <p>2.4 Component instructions</p>

3. Tools	<ul style="list-style-type: none"> <li>3.1 Measuring tools</li> <li>3.2 Wrenches</li> <li>3.3 Spirit level/water level</li> <li>3.4 Wire stripper/crimper</li> <li>3.5 Plumb bob</li> <li>3.6 Swaging tools,</li> <li>3.7 Water hose</li> <li>3.8 Flaring tools</li> <li>3.9 Screw driver</li> <li>3.10 Bench Vice</li> <li>3.11 Chisel</li> <li>3.12 C Clamp</li> <li>3.13 Hammer (claw and ball peen)</li> <li>3.14 Hammer</li> <li>3.15 Hacksaw</li> <li>3.16 Masonry wall cutter hole saw</li> <li>3.17 Torque Wrench</li> <li>3.18 Steel wire brush</li> <li>3.19 Electric drill</li> <li>3.20 Tube cutter</li> <li>3.21 Masonry tools (e.g., trowel, spade, level, etc.)</li> <li>3.22 Tube bender</li> <li>3.23 Ladders and scaffolding</li> <li>3.24 Block vice</li> <li>3.25 Pliers</li> <li>3.26 Reamer</li> <li>3.27 Screwdriver</li> <li>3.28 Ellen key set</li> </ul>
4. Equipment	<ul style="list-style-type: none"> <li>4.1 Multimeter</li> <li>4.2 Clamp on meter</li> <li>4.3 Leak detector</li> <li>4.4 Magger</li> <li>4.5 Charging station</li> <li>4.6 Weight scale</li> <li>4.7 Two stage Vacuum Pump</li> </ul>
5. Materials	<ul style="list-style-type: none"> <li>5.1 Rawal bolt</li> <li>5.2 Drill bits</li> <li>5.3 Filler rod.</li> <li>5.4 Welding flux</li> <li>5.5 Electrical cable</li> <li>5.6 Rawal plugs</li> <li>5.7 Circuit breaker</li> <li>5.8 Switch</li> <li>5.9 Masonry materials (e.g. cement, sand, etc.)</li> <li>5.10 Refrigerants</li> <li>5.11 Dry nitrogen</li> </ul>

	<ul style="list-style-type: none"> <li>5.12 Steel bracket</li> <li>5.13 Insulation Tape</li> <li>5.14 Pipe insulation</li> <li>5.15 Copper tube</li> <li>5.16 PVC pipe</li> <li>5.17 Clamp</li> <li>5.18 Copper and brass fittings</li> <li>5.19 Plastic tubing/clamp</li> <li>5.20 Screw</li> <li>5.21 Nut, bolt and washer</li> <li>5.22 Adhesive</li> </ul>
6. Positioning and levelling	<ul style="list-style-type: none"> <li>6.1. Slope backwards 2-4 degrees</li> <li>6.2. Distance between wall and condenser 30cm ~2m</li> </ul>
7. Sealant	<ul style="list-style-type: none"> <li>7.1 Rubber</li> <li>7.2 Foam</li> <li>7.3 Plastic</li> <li>7.4 Silicone</li> </ul>
<p><b>Evidence Guide</b></p> <p>The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency</p>	
1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Applied safety rules and procedures in the work place</li> <li>1.2 Prepared cavity for installation of unit</li> <li>1.3 Positioned/levelled air-conditioning unit</li> <li>1.4 Completed installation according to specifications</li> <li>1.5 Evacuated system using vacuum pump,</li> <li>1.6 Charged gas is by weight using</li> <li>1.7 Ensured satisfactory performance of the of the system</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1 Refrigeration cycle</li> <li>2.2 Single and 3 phase electrical power supply system</li> <li>2.3 Types of tools, testing &amp; measuring instruments used in installation</li> <li>2.4 Refrigerants and their applications.</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Preparing materials</li> <li>3.2 Cutting, bending, swaging and flaring of tubes.</li> <li>3.3 Performing masonry, carpentry and plumbing work</li> <li>3.4 Apply Installing techniques of window-type and split type air-conditioning unit</li> <li>3.5 Testing power supply</li> <li>3.6 Connecting power circuit</li> <li>3.7 Selection correct type of refrigerant.</li> <li>3.8 Evacuating &amp; charging of refrigeration systems</li> <li>3.9 Testing Performance of the unit</li> </ul>

4. Underpinning Attitudes	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Promptness in carrying out activities</li> <li>4.3 Sincere and honest to duties</li> <li>4.4 Environmental concerns</li> <li>4.5 Eagerness to learn</li> <li>4.6 Tidiness and timeliness</li> <li>4.7 Respect for rights of peers and seniors in workplace</li> <li>4.8 Communication with peers and seniors in workplace</li> </ul>
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>5.1. Workplace (simulated or actual)</li> <li>5.2. Tools and equipment appropriate for work activities</li> <li>5.3. Materials for work activities</li> </ul>
6. Methods of Assessment	<p>Methods of assessment may include but not limited to:</p> <ul style="list-style-type: none"> <li>6.1. Written test</li> <li>6.2. Demonstration</li> <li>6.3. Oral questioning</li> <li>6.4. Portfolio</li> </ul>
7. Context of Assessment	<ul style="list-style-type: none"> <li>7.1. Competency assessment must be done in NSDA accredited assessment centre</li> <li>7.2. Assessment should be done by a NSDA certified/nominated assessor</li> </ul>
<p><b>Accreditation Requirements</b></p> <p>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.</p>	

<b>Unit Code and Title</b>	<b>OURAC004L2V1: Install, Service and Repair Display Case Freezer</b>
<b>Nominal Hours</b>	<b>30 Hours</b>
<b>Unit Descriptor</b>	This unit covers the knowledge, skill and attitude required to Install, service and repair display case freezer in the workplace. It specially includes the tasks of taking preparation for repairing, install display case freezer, Checking and testing display case freezer and repair display case freezer.
<b>Elements of Competency</b>	<b>Performance Criteria</b> <b><u>Bold and Underlined</u></b> terms are elaborated in the Range of Variables.
1. Prepare for Repairing	<p>1.1. Appropriate <b><u>PPE</u></b> is selected and used in line with job requirements;</p> <p>1.2. Work instructions are interpreted to determine job requirements;</p> <p>1.3. Necessary <b><u>Tools and equipment</u></b> are selected in accordance with job requirements;</p> <p>1.4. Measuring and repairing instruments are calibrated as per work requirement;</p> <p>1.5. Necessary <b><u>materials</u></b> are selected as per job requirement;</p>
2. Install display case freezer	<p>2.1. Freezer unit including refrigeration piping installed according to drawing;</p> <p>2.2. Electrical circuits for the freezer unit installed and connected;</p> <p>2.3. Freezer unit operated and tested as per standard procedure;</p>
3. Check and Test Display case Freezer	<p>3.1 Systematic <b><u>pre-testing procedure</u></b> is observed in accordance with manufacturer's instructions;</p> <p>3.2 Motor terminals are checked using specified testing procedures;</p> <p>3.3 Body / cabinet / mounts checked and restored to the required condition;</p> <p>3.4 System pressure and gas leaks tested using specified test instruments;</p> <p>3.5 Control settings/adjustments are checked as per service-manual;</p> <p>3.6 All <b><u>components</u></b> of refrigerant and <b><u>electrical</u></b> / electronic circuit are checked as per standard procedures;</p> <p>3.7 Symptoms of system defects/Faults are identified and documented;</p>
4. Repair display case freezer	<p>4.1 Thermostat, door gasket is serviced / replaced where necessary;</p> <p>4.2 Defective parts/components are check and replaced as per standard;</p> <p>4.3 Control settings and adjustments are performed as per requirement;</p>

	<p>4.4 System is evacuated using vacuum pump, recovered refrigerant stored in recovery unit using specified equipment according to specifications;</p> <p>4.5 Refrigerant is charged by weight using specified equipment according to specifications;</p> <p>4.6 Cleaning of unit is performed in accordance with standard procedures;</p> <p>4.7 Unit is operated and <b>tested &amp; checked</b> to ensure performance according to manufactures specifications;</p>
5. Clean, maintain workplace tools and equipment	<p>5.1 Routine maintenance is performed as per manufactures specifications;</p> <p>5.2 Unsafe or faulty tools are identified and marked;</p> <p>5.3 Tools and equipment are maintained and cleaned as per instruction manual;</p> <p>5.4 Work place is cleaned in accordance with environmental requirement;</p> <p>5.5 Tools and equipment are stored in appropriate location as per workplace procedures;</p>
<b>Range of Variables</b>	
<b>Variable</b>	<b>Range (may include but not limited to):</b>
1. PPE	<p>1.1 Hand gloves</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 Safety Goggles</p> <p>1.5 Helmet</p> <p>1.6 Mask</p>
2. Tools	<p>2.1 Pliers</p> <p>2.2 Screwdriver</p> <p>2.3 Hammer</p> <p>2.4 Wrenches</p> <p>2.5 Tube cutter</p> <p>2.6 Capillary tube</p> <p>2.7 Wire stripper</p> <p>2.8 Crimper</p> <p>2.9 Tube bender</p> <p>2.10 Swaging tools set</p> <p>2.11 Flaring tools set</p> <p>2.12 Reamer</p> <p>2.13 Allen key set</p> <p>2.14 Lock ring set</p>



3. Equipment	3.1. Gas welding equipment 3.2. Multimeter 3.3. Clamp-on meter 3.4. Leak detector 3.5. Gauge manifold with hose pipe 3.6. Nitrogen regulator 3.7. Micron gauge 3.8. Charging station 3.9. Weighing scale 3.10. Two stage Vacuum pump 3.11. Temperature meter
4. Material	4.1 Refrigerants 4.2 Nitrogen regulator 4.3 Charging nipple 4.4 Copper tube 4.5 PVC pipe and fittings 4.6 Filler rod 4.7 Solvent cement 4.8 Welding flux 4.9 Filter drier/Strainer 4.10 Capillary tube 4.11 Lubricating oil 4.12 Copper and brass fittings 4.13 Cable 4.14 Lock ring
5. Pre-testing procedure	5.1 Visual inspection of the unit with power off 5.2 Interview of customer re-history of unit 5.3 Psychrometer and Hygrometer graph/data 5.4 Operate the unit according to manual to confirm defects
6. Components of Electrical Circuit	6.1 Compressor motor 6.2 Overload protector 6.3 Starting relay 6.4 Thermostat switch 6.5 Heater 6.6 Timer motor 6.7 Cabinet light/lamp 6.8 Cooling fan
7. Components of refrigeration	7.1. Compressor 7.2. Condenser 7.3. Expansion device 7.4. Evaporator 7.5. Filter / drier 7.6. Receiver 7.7. Accumulator

8. Test & Check	8.1. Continuity 8.2. Mechanical 8.3. Leak test 8.4. Pressure test 8.5. Ground/earth test 8.6. The temperature at specified places, including ambient Temperature 8.7. Current drawn while running. 8.8. Current drawn on starting
<b>Evidence Guide</b> 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	Assessment required evidence that the candidate: 1.1. Selected appropriate processes, tools, materials and equipment based on job requirements 1.2. Checked to identify fault 1.3. Evacuated system using vacuum pump, 1.4. Recovered refrigerant stored in recovery unit 1.5. Charged gas is by weighing scale. 1.6. Repaired and serviced soft drink cooler
2. Underpinning knowledge	2.1. Refrigeration cycle 2.2. Single and 3 phase electrical power supply system 2.3. Types of tools, testing & measuring instruments 2.4. Type of refrigerants and their applications 2.5. Refrigerant recovery and recycling
3. Underpinning skills	3.1. Interpretation of sketches and manuals. 3.2. Checking power supply and correct fault. 3.3. Measuring voltage and current using electrical test. 3.4. Handling tools & equipment safely 3.5. Cutting, bending, swaging and flaring of tubes. 3.6. Welding and brazing. 3.7. Selection correct type of refrigerant. 3.8. Evacuating & charging of refrigeration systems 3.9. Detection and repairing of leaks. 3.10. Commissioning of display unit and bottle cooler
4. Underpinning Attitudes	4.1. Commitment to occupational health and safety 4.2. Environmental concerns 4.3. Eagerness to learn 4.4. Tidiness and timeliness 4.5. Respect for rights of peers and seniors in workplace
5. Resource implications	The following resources must be provided: 5.1. Adequate workplace. 5.2. Tools and equipment. 5.3. Materials are relevant to the relevant to work activity.

	5.4. Drawing and specifications relevant to the work.
6. Methods of assessment	Competency should be assessed by 6.1. Demonstration 6.2. Oral questioning 6.3. Written test 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.

<b>Unit Code and Title</b>	<b>OURAC005L2V1: Repair and Maintain Humidifier and De-humidifier</b>
<b>Nominal Hours</b>	<b>30 Hours</b>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitudes required to repair and maintain Humidifier & Dehumidifier in the workplace. It specially includes the tasks of taking preparation for repairing, checking and Identifying faults and maintain/repair Humidifier & Dehumidifier.
<b>Elements of Competency</b>	<b>Performance Criteria</b> <b><u>Bold and Underlined</u></b> terms are elaborated in the Range of Variables.
1. Prepare for repairing	<p>1.1 Appropriate <b><u>PPE</u></b> is selected and used in line with job requirements;</p> <p>1.2 Work instructions are interpreted to determine job requirements;</p> <p>1.3 Necessary <b><u>Tools and equipment</u></b> are selected in accordance with job requirements;</p> <p>1.4 Repairing instruments are calibrated as per work requirement;</p> <p>1.5 Necessary <b><u>materials</u></b> are selected as per job requirement;</p>
2. Check and Identify faults	<p>2.1. Systematic <b><u>pre-testing procedure</u></b> is observed in accordance with manufacturer's instructions;</p> <p>2.2. Symptoms of system defects/Fault are identified using appropriate tools and equipment;</p> <p>2.3. Continuity of motor is checked and isolated using specified testing procedures;</p> <p>2.4. Control settings/adjustments are checked in conformity with service- manual specifications;</p> <p>2.5. All <b><u>components of the electrical</u></b> / electronic circuit are checked according to standard procedures;</p> <p>2.6. Leak testing are performed to identity leakage of the unit as per standard procedure;</p> <p>2.7. Faults are identified based on checking;</p>
3. Maintain and Repair Humidifier	<p>3.1. Defective parts/<b><u>components</u></b> are replaced with identical or recommended appropriate to equivalent ratings;</p> <p>3.2. Control settings/adjustments are performed in conformity with service-manual specifications;</p> <p>3.3. Unit operated and checked to ensure satisfactory performance according to manufactures specifications;</p>

4. Maintain and Repair Dehumidifier	<p>4.1 Dehumidifier is evacuated using vacuum pump and recovered refrigerant stored in recovery unit;</p> <p>4.2 Refrigerant is charged by weight using specified equipment according to specifications;</p> <p>4.3 Unit operated and checked to ensure satisfactory performance according to manufactures specifications;</p> <p>4.4 Micro switch/ Float valve is checked and replaced if required;</p>
5. Clean and store tools and equipment	<p>5.1 Tools, equipment and repaired units are cleaned in conformity with manufacturer's specifications;</p> <p>5.2 Work place is cleaned in accordance with environmental requirement;</p> <p>5.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures;</p>
<b>Range of Variables</b>	
<b>Variable</b>	<b>Range (may include but not limited to):</b>
1. PPE	<p>1.1 Hand gloves.</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 Safety goggles</p> <p>1.5 Helmet</p> <p>1.6 Mask</p>
2. Work instructions	<p>2.1 Manufacturer's recommendations/specifications</p> <p>2.2 Installation drawings</p> <p>2.3 Blueprints</p> <p>2.4 Components instructions</p>
3. Tools	<p>3.1 Pliers</p> <p>3.2 Hammer</p> <p>3.3 Screwdriver</p> <p>3.4 Tube cutter</p> <p>3.5 Capillary cutter</p> <p>3.6 Wrenches</p> <p>3.7 Tube bender</p> <p>3.8 Wire stripper/crimper</p> <p>3.9 Block vice</p> <p>3.10 Swaging tools,</p> <p>3.11 Flaring tools</p> <p>3.12 Reamer</p> <p>3.13 Deburring</p> <p>3.14 Ellen key set</p>
4. Equipment	<p>4.1 Multimeter</p> <p>4.2 Gas welding equipment</p> <p>4.3 Clamp on meter</p> <p>4.4 Leak detector</p>

	<ul style="list-style-type: none"> <li>4.5 Charging station</li> <li>4.6 Weighing scale</li> <li>4.7 Two stage vacuum pump</li> <li>4.8 Dry nitrogen cylinder with two stage regulator</li> <li>4.9 Digital temperature meter</li> <li>4.10 Psychrometer</li> <li>4.11 Hygrometer</li> </ul>
5. Material	<ul style="list-style-type: none"> <li>5.1 Refrigerants</li> <li>5.2 Dry nitrogen</li> <li>5.3 Charging nipple</li> <li>5.4 Copper tube Filler rod</li> <li>5.5 Welding flux</li> <li>5.6 Filter drier/Strainer</li> <li>5.7 Capillary tube</li> <li>5.8 Lubricating oil</li> <li>5.9 Insulation materials</li> <li>5.10 Copper tube</li> </ul>
6. Pre-testing procedures	<ul style="list-style-type: none"> <li>6.1 Visual inspection of the unit with power off</li> <li>6.2 Interview of customer re-history of unit</li> <li>6.3 Psychrometer and Hygrometer graph/data</li> <li>6.4 Operate the unit according to manual to confirm defects</li> </ul>
7. Components	<ul style="list-style-type: none"> <li>7.1 Compressor</li> <li>7.2 Condenser</li> <li>7.3 Refrigerant flow controller</li> <li>7.4 Evaporator</li> <li>7.5 Receiver</li> <li>7.6 Filter/Drier</li> <li>7.7 Spinning disc</li> <li>7.8 Air conveyor</li> <li>7.9 Air filter</li> <li>7.10 Ring of blade</li> </ul>
8. Components of Electrical Circuit	<ul style="list-style-type: none"> <li>8.1. Control panel</li> <li>8.2. Overload protector</li> <li>8.3. Starting relays</li> <li>8.4. Capacitor</li> <li>8.5. Solenoid valve</li> <li>8.6. Micro switch</li> <li>8.7. Humidity controller</li> <li>8.8. Heating elements</li> <li>8.9. Timers and other related electrical components.</li> <li>8.10. Fan motors</li> </ul>

9. Test & Check	<ul style="list-style-type: none"> <li>9.1. Insulation resistance</li> <li>9.2. Continuity</li> <li>9.3. Timing Sequence</li> <li>9.4. Leak</li> <li>9.5. Motor Terminal</li> <li>9.6. Current drawn while running</li> <li>9.7. Current drawn on starting</li> </ul>
<p><b>Evidence Guide</b> The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.</p>	
1. Critical aspects of competency	<p>Assessment required evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1. Applied safety rules and procedures</li> <li>1.2. Prepared the unit and required materials, tools equipment</li> <li>1.3. Identified faults and defects in accordance with testing procedures and documented the programs</li> <li>1.4. Repaired Humidifier and Dehumidifier as per diagnosed faults.</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1. Refrigeration cycle</li> <li>2.2. Single and 3 phase electrical power supply system</li> <li>2.3. Types of tools, testing &amp; measuring instruments used in Humidifier &amp; Dehumidifier</li> <li>2.4. Type of refrigerants their properties and applications.</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1. Checking power supply and electrical/electronic circuits Measuring Voltage and Current using electrical test equipment Cutting, bending, swaging and flaring of tubes</li> <li>3.2. Welding and brazing</li> <li>3.3. Evacuating &amp; charging of Humidifier &amp; Dehumidifier Detection and repair of gas leaks</li> <li>3.4. Applying techniques of testing performance and making adjustments in</li> <li>3.5. Humidifier &amp; Dehumidifier</li> </ul>
4. Underpinning attitudes	<ul style="list-style-type: none"> <li>4.1. Commitment to occupational health and safety</li> <li>4.2. Environmental concerns</li> <li>4.3. Eagerness to learn</li> <li>4.4. Tidiness and timeliness</li> <li>4.5. Respect for rights of peers and seniors in workplace Respect for rights of peers and seniors in workplace.</li> </ul>
5. Resource implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>5.1. Adequate workplace.</li> <li>5.2. Tools and equipment appropriate to work activities.</li> <li>5.3. Materials relevant to the proposed activity.</li> <li>5.4. Drawings and specifications relevant to the task.</li> </ul>

6. Methods of assessment	Competency should be assessed by: 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
<p><b>Accreditation Requirements</b>          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.</p>	



<b>Unit Code and Title</b>	<b>OURAC006L2V1: Service and Maintain Dispensing Unit and Bottle Coolers</b>
<b>Nominal Hours</b>	<b>20 Hours</b>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skill and attitude required to service and maintain dispensing unit and bottle coolers in the workplace.</p> <p>It specially includes the tasks of taking preparation for repairing identifying faults, checking and testing water coolers and dispensing unit and repairing water cooler and dispensing units.</p>
<b>Elements of Competency</b>	<p><b>Performance Criteria</b>  <b>Bold and Underlined</b> terms are elaborated in the Range of Variables.</p>
1. Prepare for Repairing	<p>1.1 Appropriate <b>PPE</b> is selected and used in line with job requirements;</p> <p>1.2 <b>Work instructions</b> are interpreted to determine job requirements;</p> <p>1.3 Necessary <b>Tools and equipment</b> are selected in accordance with job requirements;</p> <p>1.4 Repairing instruments are calibrated as per work requirement;</p> <p>1.5 Necessary <b>materials</b> are selected as per job requirement;</p>
2. Check and Test water coolers	<p>2.1 Water cooler is checked to identify fault according to standard procedures;</p> <p>2.2 All <b>components of the electrical</b> / electronic circuit are checked according to standard procedures;</p> <p>2.3 Continuity of compressor motor is checked and isolated using specified testing procedures;</p> <p>2.4 Body, cabinet and mounts are checked and restored to the required condition;</p> <p>2.5 Leak testing is performed to identify leakage of the unit as per standard procedure;</p> <p>2.6 All <b>components</b> of the refrigerant circuit checked according to manufactures specifications;</p> <p>2.7 Faults are identified based on checking;</p>
3. Check and Test dispensing unit	<p>3.1 Dispensing unit is checked to identify fault according to standard procedures;</p> <p>3.2 All components of the electrical / electronic circuit are checked according to standard procedures;</p> <p>3.3 Continuity of compressor motor is checked and isolated using specified testing procedures;</p> <p>3.4 Body, cabinet and mounts are checked and restored to the required condition;</p>

	<p>3.5 Leaks testing is performed to identify leakage of the unit as per standard procedure;</p> <p>3.6 All components of the refrigerant circuit checked according to manufactures specifications;</p> <p>3.7 Faults are identified based on checking;</p>
4. Repair water cooler	<p>4.1 System is evacuated using vacuum pump, recovered refrigerant stored in recovery unit;</p> <p>4.2 Refrigerant is charged by weight using specified equipment according to specifications;</p> <p>4.3 Thermostat is checked and serviced / replaced where necessary, to ensure proper functioning;</p> <p>4.4 Interior cooler space is cleaned and ensured dust / debris free;</p> <p>4.5 Unit is operated and <b>tested and checked</b> to ensure satisfactory performance according to manufactures specifications;</p>
5. Repair dispensing unit	<p>5.1 System is evacuated using vacuum pump, recovered refrigerant stored in recovery unit;</p> <p>5.2 Refrigerant is charged by weight using specified equipment according to specifications;</p> <p>5.3 Thermostat is checked and serviced / replaced where necessary to ensure proper functioning;</p> <p>5.4 Interior hot water tank is cleaned and ensured dust free;</p> <p>5.5 Heater element and temperature control and sensing devices are checked and replaced if required;</p> <p>5.6 Unit is operated and checked to ensure performance;</p>
6. Perform routine maintenance, clean and store tools and equipment	<p>6.1 Tools and equipment are maintained and cleaned as per instruction manual;</p> <p>6.2 Work place is cleaned in accordance with environmental requirement;</p> <p>6.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures;</p>
<b>Range of Variables</b>	
<b>Variables</b>	<b>Range (may include but not limited to):</b>
1. PPE	<p>1.1 Hand gloves.</p> <p>1.2 Safety Shoes.</p> <p>1.3 Apron</p> <p>1.4 Safety goggles</p> <p>1.5 Helmet</p> <p>1.6 Mask</p>
2. Work instructions	<p>2.1 Manufacturer's recommendations/specifications</p> <p>2.2 Installation drawings</p> <p>2.3 Blueprints</p>

	2.4 Component's instructions
3. Tools	3.1 Pliers 3.2 Screwdriver 3.3 Hacksaw 3.4 Capillary cutter 3.5 Wrenches 3.6 Wire stripper/crimper 3.7 Swaging tools, 3.8 Flaring tools 3.9 Bench Vice 3.10 C Clamp 3.11 Hammer 3.12 Steel wire brush 3.13 Tube cutter 3.14 Tube bender 3.15 Block vice 3.16 Reamer 3.17 Ellen key set
4. Equipment	4.1 Special Refrigeration & air conditioning equipment 4.2 Gas welding equipment 4.3 Multimeter 4.4 Clamp on meter 4.5 Leak detector 4.6 Charging station 4.7 Weight scale 4.8 Two stage vacuum pumps 4.9 Dry nitrogen cylinder with two stage regulators 4.10 Digital temperature meter
5. Materials	5.1 Fittings (elbow Copper T socket, brass union, reducing unit, brass T,) 5.2 Refrigerants 5.3 Dry nitrogen 5.4 Charging nipple 5.5 Copper tube 5.6 Filler rod 5.7 Welding flux 5.8 Filter drier/Strainer 5.9 Capillary tube 5.10 Lubricating oil
6. Components of Electrical Circuit	6.1 Compressor motor 6.2 Overload protector 6.3 Starting relays 6.4 Thermostat 6.5 Low-and high-Pressure cutout 6.6 Heaters

	<ul style="list-style-type: none"> <li>6.7 Timers</li> <li>6.8 Solenoid valve</li> <li>6.9 Water flow switch with meter</li> <li>6.10 Water pump</li> <li>6.11 Condenser fan</li> <li>6.12 Capacitor</li> <li>6.13 Control panel</li> <li>6.14 Temperature sensor</li> <li>6.15 Inlet and outlet water temperature sensor</li> </ul>
7. Test & Checking	<ul style="list-style-type: none"> <li>7.1 Insulation</li> <li>7.2 Resistance</li> <li>7.3 Mechanical</li> <li>7.4 Continuity</li> <li>7.5 Timing Sequence</li> <li>7.6 Leak</li> <li>7.7 Ground/earth test</li> <li>7.8 Heating element</li> <li>7.9 The pressures in the cooling system (suction &amp; discharge)</li> <li>7.10 The temperature at specified places, including ambient</li> <li>7.11 Water Temperature.</li> <li>7.12 Current drawn while running.</li> <li>7.13 Current drawn on starting</li> </ul>
<p><b>Evidence Guide</b>  The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency</p>	
1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Applied safety rules and procedures.</li> <li>1.2 Prepared the units and required materials, tools and equipment properly.</li> <li>1.3 Checked and Identified faults and defects.</li> <li>1.4 Serviced and maintain water coolers as per identified faults.</li> <li>1.5 Operated units and checked to ensure satisfactory performance</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1. Function of water cooler</li> <li>2.2. Use of water cooler</li> <li>2.3. Function of dispensing unit</li> <li>2.4. Use of dispensing unit</li> <li>2.5. Refrigeration cycle</li> <li>2.6. Types of tools, testing &amp; measuring instruments used in water coolers and dispensing unit</li> <li>2.7. Type of refrigerants and their application</li> </ul>

3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Interpretation of measurements, manufacturer's manuals, specifications.</li> <li>3.2 Checking power supply and electrical/electronic circuits Measuring voltage and current using electrical test equipment</li> <li>3.3 Cutting, bending, swaging and flaring of tubes</li> <li>3.4 Welding and brazing</li> <li>3.5 Selection of correct type of refrigerant Evacuating &amp; charging of refrigeration systems Detection and repair of gas leaks</li> <li>3.6 Charging of refrigerants and commissioning of water coolers.</li> </ul>
4. Underpinning Attitudes	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Promptness in carrying out activities</li> <li>4.3 Sincere and honest to duties</li> <li>4.4 Environmental concerns</li> <li>4.5 Eagerness to learn</li> <li>4.6 Tidiness and timeliness</li> <li>4.7 Respect for rights of peers and seniors in workplace</li> <li>4.8 Communication with peers and seniors in workplace</li> </ul>
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>5.1 Workplace (simulated or actual)</li> <li>5.2 Tools and equipment appropriate for work activities</li> <li>5.3 Materials for work activities</li> </ul>
6. Methods of Assessment	<p>Methods of assessment may include but not limited to:</p> <ul style="list-style-type: none"> <li>6.1 Written test</li> <li>6.2 Demonstration</li> <li>6.3 Oral questioning</li> <li>6.4 Portfolio</li> </ul>
7. Context of Assessment	<ul style="list-style-type: none"> <li>7.1 Competency assessment must be done in NSDA accredited assessment centre</li> <li>7.2 Assessment should be done by a NSDA certified/nominated assessor</li> </ul>
<p><b>Accreditation Requirements</b></p> <p>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.</p>	

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This Competency Standard for **Refrigeration and Airconditioning** 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.

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