NATIONAL VOCATIONAL QUALIFICATION

NVQF LEVEL 1REFRIGERATION AND AIR-CONDITIONING

(INSTALLATION MAINTENANCE AND REPAIRS)

Mandatory Units

S/No /Unit No	Reference Number	NOS Title	Credit Value	Guided Learning Hours	Remark
1	CON/RAC/001/1	**Basic concept of Refrigeration and air-conditioning**	3	30hrs	Level 1 NVQF/QCF
2	CON/RAC/002/1	**Communication in refrigeration and air-conditioning working environment**	3	30hrs	Level 1 NVQF/QCF
3	CON/RAC/003/1	**Work safely in refrigeration and air-conditioning working environment**	3	30hrs	Level 1 NVQF/QCF
4	CON/RAC/004/1	Sheet metal works in refrigeration	4	40hrs	Level 1 NVQF/QCF
5	CON/RAC/005/1	Evacuating and Charging	6	60hrs	Level 1 NVQF/QCF
6	CON/RAC/006/1	**Checking electrical faults, and repairs.**	6	60hrs	Level 1 NVQF/QCF

NOTE: This is a 25credit qualification, to achieve this qualification; Learners are required to achieve 13 credits from mandatory units and 6 credits from the optional units. Each Credit is equivalent to approx. 10 Guided Learning Hours (GLH). The Total Learning Hours will therefore consist of the GLH *plus* the independent learning hours of the candidate,

which is generally 50% – 150% of the GLH. ***The actual Total Learning Hours for each Credit will then be a minimum of 15 hours***.

Qualification Purpose: This qualification is about equipping the learner with the basic concept of Refrigeration and Air Conditioning, introducing the learner to basic sheet metal work, trouble shooting and repairs of electrical faults, evacuation and charging in Refrigeration.

GUIDE

Unit title	Provides a clear explanation of the content of the unit.
Unit number	The unique number assigned to the unit
Unit reference	The unique reference number given to each unit at qualification approval by NBTE
Unit level	Denotes the level of the unit within the National Vocational Qualification framework NVQF.
Unit credit value	The value that has been given to the unit based on the expected learning time for an average learner. 1 credit = 10 learning hours
Unit aim	Provides a basic concept of the unit content.
Learning outcome	A statement of what a learner will know, understand or be able to do, as a result of a process of learning.
Assessment criteria	A description of the requirements a learner must achieve to demonstrate that a learning outcome has been met.
	Any additional guidance provided to

Unit assessment guidance	support the assessment of the unit.
Unit guided learning hours	The average number of hours of supervised or directed study time or assessment required to achieve a qualification or unit of a qualification.

National Vocational Qualification
CONSTRUCTION SECTOR
LEVEL 1: REFRIGERATION AND AIR-CONDITIONING

Unit 1: Basic concept of Refrigeration and air-conditioning

Unit Reference Number: CON/RAC/001/1

NVQ Level: 1

Credit Value: 3

Guided Learning Hours: 30hrs

Unit Purpose: This is about equipping the learner with the basic concept of refrigeration and air-conditioning.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal statement (PS) or Reflective Practice (RP)
5. Recognition of Prior Learning (RPL)
6. Other methods (Ot), assignments, case study, essay, project, etc.

UNIT 01: Basic concept of Refrigeration and air-conditioning

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: DEMONSTRATE THE BASIC CONCEPT OF REFRIGERATION	1.1	Explain what is refrigeration									
	1.2	Describe types of refrigeration systems									
	1.3	Explain classification of refrigeration									
	1.4	Define vapour compression system									
	1.5	Explain the working of the vapour compression system									
	1.6	Sketch the schematic diagram of vapour compression system									
LO 2: DEMONSTRATE THE KNOWLEDGE OF BASIC TERMS OF AIR-CONDITIONING	2.1	Explain what is air-conditioning									
	2.2	Describe types of air-conditioning systems									
	2.3	Explain the working of domestic air conditioning system									
	2.4	Sketch the schematic diagram of domestic air-conditioning system									
	2.5	Label the schematic diagram of domestic air-conditioner									
LO 3: DEMONSTRATE THE BASIC KNOWLEDGE OF REFRIGERANT.	3.1	Explain what is a refrigerant									
	3.2	Explain coding of refrigerants									
	3.3	Identify refrigerants according to colour coding									
	3.4	Explain refrigerants according to number codes									
	3.5	State properties of a refrigerant									
LO 4: OUTLINE THE CAREER OPPORTUNITIES IN REFRIGERATION AND AIR-CONDITIONING	4.1	Identify job opportunities in refrigeration and air-conditioning.									
	4.2	State the types of job specialties in refrigeration and air-conditioning:									
	4.3	Explain jobs specification of the following specialties in refrigeration and air-conditioning: • Sales Engineer. • Application Engineer. • Maintenance Technician. • Sheet Metal Experts. • Installers. • Oxy-acetylene Welding expert.(Pipe Work expert)									
LO 5: OUTLINE THE	5.1	Identify types of materials used for external body framework of refrigerator									
	5.2	Describe the types of materials used as									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
MATERIALS USED IN THE FABRICATION OF REFRIGERATION PARTS.		insulator in refrigerator									
	5.3	Explain the types of materials used for internal body framework of a refrigerator									
	5.2	Explain condensers in refrigeration system									
	5.3	Explain everporators in refrigeration system									
	5.4	Explain the types of pipes used in evaporators and condensers units of refrigerators									
	5.5	Distinguish between pipes used in evaporators and condensers units of refrigerators									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Additional information about the unit	
Unit aim(s)	**The aim of this unit is about equipping the learner with the basic concept of refrigeration and air-conditioning**.
Unit expiry date	Dec. 2021
Details of the relationship between the unit and relevant national occupational standards (if appropriate)	

Details of the relationship between the unit and other standards or curricula (if appropriate)	
Assessment requirements specified by a sector or regulatory body (if appropriate)	
Endorsement of the unit by a sector or other appropriate body (if required)	
Location of the unit within the subject/sector classification system	Construction Sector
Name of the organisation submitting the unit	
Guided Learning Hours	30

National Vocational Qualification

CONSTRUCTION SECTOR

LEVEL 1: REFRIGERATION AND AIR-CONDITIONING

Unit 2: Communication in refrigeration and air-conditioning working environment

Unit Reference Number: CON/RAC/002/1

NVQ Level: 1

Credit Value: 3

Guided Learning Hours: 30hrs

Unit Purpose: This unit is to equip the learner to communicate effectively in the working environment.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal statement (PS) or Reflective Practice (RP)
5. Recognition of Prior Learning (RPL)
6. Other methods (Ot), assignments, case study, essay, project, etc.

Unit 2: Communication in refrigeration and air-conditioning working environment

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: UNDESTAND THE USE OF NON COMPLEX COMMUNICATION SYSTEM IN A WORK ENVIRONMENT	1.1	Use verbal means of communication.									
	1.2	Apply non-verbal means of communication									
	1.3	Explain the use of simple verbal means to pass on necessary information									
	1.4	Explain the use non-verbal means to pass on necessary information e.g. body language									
	1.5	Use symbols and signs appropriately									
LO 2: IDENTIFY THE SOURCES OF INFORMATION IN A WORK ENVIRONMENT	2.1	Identify source of information in an organizational work environment.									
	2.2	Distinguish how to relate with sources of information									
	2.3	Use various information flow systems in work environment									
	2.4	Use information to avoid challenges in work situations.									
	2.5	Explain findings in accordance to procedure in work environment									
LO 3: COMMUNICATE IN A WORK ENVIRONMENT	3.1	Identify various communications equipment in work environment.									
	3.2	Use effectively various communications equipment in work environment.									
	3.3	Pass information effectively to right personnel									
	3.4	Pass information effectively using symbols, signs and codes.									
	3.5	Obey instruction in line with ethics of work environment									
LO 4: OUTLINE THE CAREER OPPORTUNITIES IN REFRIGERATION AND AIR-CONDITIONING	4.1	Identify job opportunities in refrigeration and air-conditioning.									
	4.2	Outline the types of job specialties in refrigeration and air-conditioning:									
	4.3	Explain jobs specification of the following specialties in refrigeration and air-conditioning: • Sales Engineer. • Application Engineer. • Maintenance Technician.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
		• Sheet Metal Experts. • Installers. • Oxy-acetylene Welding expert. Pipe Work expert									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Additional information about the unit	
Unit aim(s)	This unit is to equip the learner to communicate effectively in the working environment.
Unit expiry date	Dec. 2021
Details of the relationship between the unit and relevant national occupational standards (if appropriate)	Construction Sector Refrigeration & Air-Conditioning
Details of the relationship between the unit and other standards or curricula (if appropriate)	
Assessment requirements specified by a sector or regulatory body (if appropriate)	
Endorsement of the unit by a sector or other appropriate body (if required)	

Location of the unit within the subject/sector classification system	Construction Sector
Name of the organisation submitting the unit	
Guided Learning Hours	30

National Vocational Qualification
CONSTRUCTION SECTOR
LEVEL 1: REFRIGERATION AND AIR-CONDITIONING

Unit 3: Work safely in Refrigeration and Air-Conditioning Working Environment

Unit Reference Number: CON/RAC/003/1

NVQ Level: 1

Credit Value: 3

Guided Learning Hours: 30hrs

Unit Purpose: This unit is to equip the learner with the concept of Health and Safety in refrigeration and air-conditioning in work environment.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal statement (PS) or Reflective Practice (RP)
5. Recognition of Prior Learning (RPL)
6. Other methods (Ot), assignments, case study, essay, project, etc.

Unit 3: Work Safely in Refrigeration and Air-Conditioning Working Environment

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: DEVELOP THE AWARENESS OF OCCUPATIONAL HEALTH ISSUES IN REFRIGERATION AND AIR-CONDITIONING WORK ENVIRONMENT	1.1	Identify health safety and risk relevant to relevant to own occupation									
	1.2	Explain occupational health and safety standards									
	1.3	Identify necessary equipment in occupational health and safety									
	1.4	Use occupational health and safety equipment									
	1.5	Identify environmental hazards and risks Explain environmental hazards and risks									
LO 2: APPLY ENVIRONMENTAL PROTECTION ISSUES IN REFRIGERATION AND AIR-CONDITIONING ACTIVITIES.	2.1	Identify tools and equipment in mitigating environmental hazards									
	2.2	Explain relevant safety rules in refrigeration and air-conditioning industry									
	2.3	Use environmental hazard mitigating tools and equipment									
	2.4	Identify risks for water, air and land pollution at workplace									
	2.5	Explain methods and possibilities to avoid environmental pollution Apply environmental protection methods in work place									
LO 3: DEMONSTRATE KNOWLEDGE OF PERSONAL SAFETY	3.1	Identify safety rules in workplace.									
	3.2	Explain safety tags and symbols.									
	3.3	Select personal protective equipment.									
	3.4	Distinguish selected personal protective equipment.									
	3.5	Use appropriate personal protective equipment correctly									
	3.6	Maintain clean working surrounding/ environment									
LO 4: APPLY THE KNOWLEDGE OF FIRST AID	4.1	Identify first aid materials and location									
	4.2	Select appropriate first aid materials for defined situations									
	4.3	Describe first aid procedures for defined situations.									
	4.4	Service first aid materials at workplace.									
	4.5	Apply first aid methods for defined situations									

Learners Signature:	**Date:**

Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Additional information about the unit	
Unit aim(s)	This unit is to equip the learner with the concept of Health and Safety in refrigeration and air-conditioning in work environment.
Unit expiry date	Dec. 2021
Details of the relationship between the unit and relevant national occupational standards (if appropriate)	Construction NOS
Details of the relationship between the unit and other standards or curricula (if appropriate)	
Assessment requirements specified by a sector or regulatory body (if appropriate)	
Endorsement of the unit by a sector or other appropriate body (if required)	
Location of the unit within the subject/sector classification system	Construction Sector Refrigeration & Air-Conditioning
Name of the organisation submitting the unit	
Guided Learning Hours	30

National Vocational Qualification
CONSTRUCTION SECTOR
LEVEL 1: REFRIGERATION AND AIR-CONDITIONING

Unit 4: Concept of Sheet Metal Works

Unit Reference Number: CON/RAC/004

NVQ/QCF Level: 1

Credit Value: 4

Guided Learning Hours: 40hrs

Unit Purpose: This unit is to equip the learner with the basic concept of fabrication of Sheet Metal Work in refrigeration and air conditioning system.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is/or is not allowed*** in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal statement (PS) or Reflective Practice (RP)
5. Work Product (WP)
6. Recognition of Prior Learning (RPL)
7. Other methods (Ot), assignments, case study, essay, project, etc.

UNIT 04: Concept of Sheet Metal Works

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: PERFORM MARKING OUT IN ALUMINUM SHEET METAL WORK	1.1	Identify types of measuring equipment.									
	1.2	Identify types of marking out tools.									
	1.3	Describe procedure followed in measurement and marking out									
	1.4	Carry out measurement and marking out of sheet metal									
LO 2: CARRY OUT BASIC FOLDING OPERATION OF SHEET METALS.	2.1	Identify tools and equipment for folding operations of sheet metals									
	2.2	State safety precautions associated with folding of sheet metals									
	2.3	Describe procedure followed in folding of sheet metals									
	2.4	Carry out folding of sheet metal									
LO 3: DEMONSTRATE THE BASIC SETTING/ HOLDING OF SHEET METAL TOGETHER WITH THE PIPE	3.1	Identify tools used in cutting of sheet metals									
	3.2	Explain safety precautions associated with setting/holding of sheet metal together with pipe									
	3.3	Describe procedure of riveting									
	3.4	Describe the procedure of cutting and folding									
	3.5	Mark out material									
	3.6	Cut material									
	3.7	Fold material to shape									
LO 4: IDENTIFY MATERIALS USED IN THE FABRICATION OF BODY FRAME WORK	5.1	Recognise types of materials used for external body framework of refrigerator									
	5.2	Outline types of materials used as insulator in refrigerator									
	5.3	Explain types of materials used for internal body framework of a refrigerator									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**

EQA Signature (if sampled)	Date:

Additional information about the unit	
Unit aim(s)	This unit is to equip the learner to understand and apply the concept of Sheet Metal Works.
Unit expiry date	Dec. 2021
Details of the relationship between the unit and relevant national occupational standards (if appropriate)	Construction sector NOS
Details of the relationship between the unit and other standards or curricula (if appropriate)	
Assessment requirements specified by a sector or regulatory body (if appropriate)	
Endorsement of the unit by a sector or other appropriate body (if required)	
Location of the unit within the subject/sector classification system	Construction Sector Refrigeration & Air-Conditioning
Name of the organisation submitting the unit	
Guided Learning Hours	30

National Vocational Qualification

CONSTRUCTION SECTOR

LEVEL 1: REFRIGERATION AND AIR-CONDITIONING

Unit 5: Understand the concept of Evacuating and Charging

Unit Reference Number: CON/RAC/005/L1

NVQF Level: 1

Credit Value: 6

Guided Learning Hours: 60

Unit Purpose: Demonstrate the basic concept and practice of Evacuating and Charging in refrigeration and air conditioning system.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Practical Assessment (PA)
4. Witness Testimony (WT)
5. Personal statement (PS) or Reflective Practice (RP)
6. Work Product (WP)
7. Recognition of Prior Learning (RPL)
8. Other methods (Ot), assignments, case study, essay, project, etc.

UNIT 05 Evacuating and Charging

LEARNING OBJECTIVE (LO) **The learner will:**		**PERFORMANCE CRITERIA** **The learner can:**	**Evidence Type**					**Evidence Ref. Page No.**			
LO 1: DEMONSTRATE THE UNDERSTANDING OF SAFETY IN EVACUATION AND CHARGING OF REFRIGERATION	1.1	Explain safety precaution involved in evacuation of gas in refrigeration									
	1.2	Explain safety precaution involved in charging of gas in refrigeration									
	1.3	Identify the safety protectives to be worn in evacuation and charging processes									
LO 2: APPLY THE KNOWLEDGE OF TOOLS AND EQUIPMENT USED IN EVACUATION AND CHARGING.	2.1	Identify tools and equipment for evacuation of unwanted particles in refrigeration system									
	2.2	Identify tools and equipment used in charging refrigerator									
	2.3	Identify refrigerant types according to codes									
LO 3: DEMONSTRATE THE PROCESS OF EVACUATION USING A VACUUM PUMP.	3.1	Describe functions of vacuum pump									
	3.2	Describe functions of a manifold gauge									
	3.3	Describe correct setting of vacuum process									
	3.4	Perform evacuation process in refrigerator									
LO 4: DEMONSTRATE THE PROCESS OF CHARGING A REFRIGERATOR	4.1	Describe methods of selecting refrigerant for particular refrigerator									
	4.2	State safety precautions associated with charging of refrigerator									
	4.3	Perform charging process in a refrigerator									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**
EQA Signature (if sampled)	**Date:**

Additional information about the unit	
Unit aim(s)	Understand the basic concept of Evacuating and Charging and also practically achieve the processes involved
Unit expiry date	Dec. 2021
Details of the relationship between the unit and relevant national occupational standards (if appropriate)	Construction NOS
Details of the relationship between the unit and other standards or curricula (if appropriate)	
Assessment requirements specified by a sector or regulatory body (if appropriate)	
Endorsement of the unit by a sector or other appropriate body (if required)	
Location of the unit within the subject/sector classification system	Construction Sector Refrigeration & Air-Conditioning
Name of the organisation submitting the unit	
Guided Learning Hours	30

Unit 6: Identify electrical faults, and repairs.

Unit Reference Number: CON/RAC/006/L1

NVQF Level: 1

Credit Value: 6

Guided Learning Hours: 60hrs

Unit Purpose: This unit is designed to equip the learner with the basic concept of identifying electrical faults and also practically achieving the processes involved in repairs.

Unit assessment requirements/evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal statement (PS) or Reflective Practice (RP)
5. Work Product (WP)
6. Recognition of Prior Learning (RPL)
7. Other methods (Ot), assignments, case study, essay, project, etc.

UNIT 06: Checking electrical faults, and repairs.

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: DEMONSTRATE THE UNDERSTANDING OF SAFETY IN ELECTRICAL WORKS	1.1	Explain safety precaution involved in tracing electrical faults									
	1.2	Explain safety precaution involved in replacing / repairing faulty electric cord									
	1.3	Explain safety precaution involved in replacing a faulty relay									
	1.4	Explain safety precaution involved in replacing a faulty capacitor									
LO 2: DEMONSTRATE THE KNOWLEDGE OF TOOLS AND EQUIPMENT USED IN ELECTRICAL WORKS	2.1	Identify tools and equipment for electric current flow testing and voltage input.									
	2.2	Identify tools and equipment used in testing and repairing relays									
	2.3	Identify the materials used in mending electric cord wire									
	2.4	Identify the materials used in replacing a faulty capacitor									
LO 3: CARRY OUT BASIC TRUBLE SHOOTING OF ELECTRICAL FAULTS	3.1	Check that compressor fan is running and compressor unit starting.									
	3.2	Check for clicking sound in the unit, which signifies overheating.									
	3.3	Check if overload, start relay and capacitor are ok.									
	3.4	Trace the electrical cord wire for damages and cut-offs.									
LO 4: REPLACE SIMPLE FAULTY ELECTRICAL PART.	4.1	Describe methods of replacing or mending a faulty electric cord wire									
	4.2	Remove a faulty capacitor and replace it with a functioning one.									
	4.3	Describe process involved in repairing an overload relay and/ replacing with a new functioning one.									
	4.4	Run a test of the replaced / repaired electrical part.									

Learners Signature:	**Date:**
Assessors Signature:	**Date:**
IQA Signature (if sampled)	**Date:**

EQA Signature (if sampled)	**Date:**

Additional information about the unit	
Unit aim(s)	This unit is to equip the learner with the basic concept of checking electrical faults and also practically achieving the processes involved in repairs
Unit expiry date	Dec. 2021
Details of the relationship between the unit and relevant national occupational standards (if appropriate)	Construction NOS
Details of the relationship between the unit and other standards or curricula (if appropriate)	
Assessment requirements specified by a sector or regulatory body (if appropriate)	
Endorsement of the unit by a sector or other appropriate body (if required)	
Location of the unit within the subject/sector classification system	Construction Sector Refrigeration & Air-Conditioning
Name of the organisation submitting the unit	
Guided Learning Hours	30