



**NATIONAL COMPETENCY STANDARDS
FOR
DOMESTIC REFRIGERATION AND AIR
CONDITIONING TECHNICIAN
(CERTIFICATE 2)**

MANUFACTURING SECTOR



**TECHNICAL & VOCATIONAL EDUCATION AND
TRAINING (TVET) QUALITY COUNCIL
BHUTAN QUALIFICATIONS AND PROFESSIONALS
CERTIFICATION AUTHORITY
THIMPHU, BHUTAN
MAY 2025**

First Publication 2015
First Revision March 2021
© Department of Occupational Standards (DOS)
Second Revision: May 2025 © TVET Quality Council

FOREWORD

The TVET Quality Council, BQPCA is pleased to present the National Competency Standards (NCS) for **Domestic Refrigeration And Air Conditioning Technician, C2**, which is developed in consultation with the field experts and trainers. The main objective of developing National Competency Standards is to set up a well-defined nationally recognized TVET Qualifications that will help in setting a benchmark for the TVET Qualifications in our country aligned to the international best practices.

The standards are developed to ensure that the TVET trainees possess the desired Skills, Knowledge and Attitude required by the industries. In order to ensure the relevancy of the competencies, the standards are developed in close consultation and partnership with industry experts and trainers from training institutes.

A training system based on National Competency Standards shall ensure that the training is relevant to the needs of the labour market. As a result, future TVET trainees will be better skilled to meet the needs and expectations of industries and employers. Such a positive impact on the employability of TVET graduates will enhance the reputation of the TVET system and make it attractive to the youths.

While acknowledging the existing level of cooperation and collaboration, the Council earnestly requests employers and training providers to extend the fullest support and cooperation in development and implementation of the National Competency Standards. The ultimate objective is to build a competent and productive national workforce that will contribute to the socio-economic development of our country. We gratefully acknowledge the valuable contributions made by experts from industries and trainers during the consultation and validation processes of the NCS development. We further look forward to improved industry engagement and active participation of trainers in the development of a quality-assured demand driven TVET system.

Director
BQPCA

ACKNOWLEDGEMENT

Date of Validation :14th May 2025

Next date of Revision :13th May 2030

The TVET Quality Council, Bhutan Qualifications and Professionals Certification Authority would like to express our deepest appreciation to the following industry and subject matter experts who have participated in revision and validation of National Competency Standards for Domestic RAC:

Experts involved in Validation of the NCS			
SN	Name	Designation	Organization
1	Nikma Dorji Tamang	Technician	JoJo's Home Appliance Repairing Service
2	Santa Bdr. Darje	Technician	Champa Electronics
3	Nim Tshering Rai	Technician	New Life Electronics
4	Puran Gurung	Technician	Champa Electronics
5	Jigme Samdrup	Technician	Freelance
6	Sonam Tobgyal	Technician	Freelance

Experts Engaged for the Revision of the NCS			
SN	Name	Designation	Organization
1	Sangay Yeshey Tongtshen	Engineer	Le Meridian, Thimphu
2	Raju Tamang	Instructor	TTI, Thimphu
3	Jurme Dorji	Technical Officer	Druk Refrigeration and Power Solution
4	Nikma Dorji Tamang	Technician	JoJo's Home Appliance Repairing Service
5	Nim Tshering Rai	Technician	New Life Electronics
6	Kado	Technician	Dolma Enterprise
7	Dilip Poudel	Technician	KD Electronics
8	Kado	Technician	Dolma Enterprise

Facilitator from the TVET Quality Council, BQPCA		
Prem Kumar Bhattarai	Program Officer	TVET QC, BQPCA

PACKAGING OF QUALIFICATIONS

CERTIFICATE 2



Carry Out Maintenance of Heat Pump/ Air Conditioner and Automotive Air Conditioner (7127-U3-L2)

Carry Out Installation of Heat Pump/Air Conditioner (7127-U2-L2)

Carry Out Maintenance of Domestic Refrigerator (7127-U1-L2)

ENTRY

OVERVIEW OF THE NCS FOR BUILDING PAINTER

Unit Title	Element of Competence
1. Carry Out Maintenance of Domestic Refrigerator	1.1 Prepare for Maintenance of Domestic Refrigerator 1.2 Perform Preventive Maintenance of Domestic Refrigerator 1.3 Perform Corrective Maintenance of Domestic Refrigerator 1.4 Conduct Test
2. Carry Out Installation of Heat Pump/Air Conditioner	2.1 Prepare for Installation of Heat Pump/ Air Conditioner 2.2 Perform Installation of Heat Pump Air Conditioner 2.3 Conduct Test
3. Carry Out Maintenance of Heat Pump/Air Conditioner and Automotive Air Conditioner	3.1 Prepare for Maintenance of Heat Pump/ Air Conditioner and Automotive Air Conditioner 3.2 Perform Preventive Maintenance of Heat Pump/ Air Conditioner and Automotive Air Conditioner 3.3 Perform Corrective Maintenance of Heat Pump/ Air Conditioner and Automotive Air Conditioner 3.4 Conduct Test

UNIT TITLE	Carry Out Maintenance of Domestic Refrigerator
DESCRIPTOR	This unit covers the competencies required to prepare for maintenance, maintain and test functionality of domestic refrigerators following safety procedures at all times
CODE	7127-U1-L2
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Prepare for Maintenance of Domestic Refrigerator	1.1 Gather PPEs as per the job requirement following standard procedure 1.2 Gather tools and equipment as per the job requirement 1.3 Gather materials as per the job requirement following standard procedure 1.4 Prepare work area following standard procedure
2. Perform Preventive Maintenance on Domestic Refrigerator	2.1 Observe Occupational and Health and Safety Procedure 2.2 Handle tools and equipment as per the job requirement 2.3 Prepare work area following standard procedure

	<p>2.4 Perform routine and periodic servicing following standard procedure</p> <p>2.5 Complete the documentation following standard procedure</p>
3. Perform Corrective Maintenance of Domestic Refrigerator	<p>3.1 Observe occupational health and safety procedures</p> <p>3.2 Troubleshoot the faults following standard procedure</p> <p>3.3 Rectify the faulty electrical and mechanical components as per the job requirement following standard procedure</p> <p>3.4 Recharge the refrigerant following standard procedure</p>
4. Conduct Test	<p>4.1 Test the refrigerator for proper functioning following standard procedure</p> <p>4.2 Complete documentation following standard procedure</p> <p>4.3 Apply 5S principles as per the job requirement</p>

RANGE STATEMENT

Personal protective equipment (PPE) may include but not limited to:

- | | |
|---|--|
| <ul style="list-style-type: none"> • Hand gloves • Workshop dress | <ul style="list-style-type: none"> • Safety shoes • Safety goggles |
|---|--|

Tools and equipment may include but not limited to:	
<ul style="list-style-type: none"> • Screw driver set • Multi meter • Pliers • Pinching pliers • Allen key set 	<ul style="list-style-type: none"> • Vacuum pump • Pressure gauge • Tester • Recovery machine/cylinder • Tube cutter
Materials may include but not limited to:	
<ul style="list-style-type: none"> • Brazing rod • Refrigerant 	<ul style="list-style-type: none"> • Copper tube • Wire
Faults may include but not limited to:	
<ul style="list-style-type: none"> • Electrical faults 	<ul style="list-style-type: none"> • Mechanical faults
Electrical components may include but not limited to:	
<ul style="list-style-type: none"> • Thermostat • Fuse • Thermal fuse • Relay • Door switch • Defrost heater 	<ul style="list-style-type: none"> • Over load protector • Capacitors • Defrost Timers • Bimetal • Fan motor
Mechanical components may include but not limited to:	
<ul style="list-style-type: none"> • Evaporator • Condenser • Compressor 	<ul style="list-style-type: none"> • Filter dryer • Copper tubes
Test may include but not limited to:	
<ul style="list-style-type: none"> • Cooling • Leakage 	<ul style="list-style-type: none"> • Power • Auto system
Documentation may include but not limited to	

<ul style="list-style-type: none"> • Maintenance / service records • Job / history cards 	<ul style="list-style-type: none"> • Bills
Critical Aspects	
<ul style="list-style-type: none"> • Demonstration of competencies in occupational health and safety practices at workplace • Demonstration of competencies in troubleshooting and rectifying the faults following standards procedure • Demonstrate competencies in recovering and recharging the refrigerant following standard procedure 	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> • Ethics and Integrity • OHS • Working principles of refrigeration system • Components and their function • Estimation and costing • Market rates • Environment rules and regulations • Types of refrigerant • Impact of refrigerant on environment • Basic electrical theory • Basic thermo dynamics 	<ul style="list-style-type: none"> • Team Work • Communication • Problem Solving • Interpersonal Relationship • Creativity • Innovation • Time Management

UNIT TITLE	Carry Out Installation of Domestic Heat Pump/ Air Conditioner
DESCRIPTOR	This unit covers the competencies required to prepare layout, install domestic air conditioner/heat pump following safety at all times
CODE	7127-U2-L2
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Prepare for Installation of Domestic Heat Pump/ Air Conditioner	<p>1.1 Prepare PPE as per the job requirement following standard procedure</p> <p>1.2 Prepare tools and equipment following standard procedure</p> <p>1.3 Estimate materials for the installation of domestic air conditioner following standard procedure</p> <p>1.4 Prepare layout for the installation as per the job requirement following standard procedure</p>
2. Perform Installation of Heat pump/ Air Conditioner	<p>2.1 Use Personal protective equipment (PPE) as per the job requirement</p> <p>2.2 Use tools and equipment as per the job requirements</p> <p>2.3 Install indoor air conditioning units following standard procedure</p>

	<p>2.4 Install outdoor air conditioning units following standard procedure</p> <p>2.5 Provide connections following standard procedure</p>
3. Conduct test	<p>3.1 Test the air conditioning units for proper functioning following standard procedure</p> <p>3.2 Complete documentation following standard procedure</p> <p>3.3 Apply 5S principles following standard procedure</p>

RANGE STATEMENT	
PPE may include but not limited to:	
<ul style="list-style-type: none"> • Gloves • Safety shoes • Safety belt • Helmet 	<ul style="list-style-type: none"> • Workshop Dress • Mask • Goggles
Tools and equipment may include but not limited to:	
<ul style="list-style-type: none"> • Drill machine • Tube cutter • Screw driver set • Multi meter • Pliers • Ladder 	<ul style="list-style-type: none"> • Flaring tools • Pressure gauge • Allen key set • Vacuum pump • Tube bender
Materials may include but not limited to:	

<ul style="list-style-type: none"> • Wires • Refrigerant 	<ul style="list-style-type: none"> • Copper Tubes • Dry nitrogen gas
Connections may include but not limited to:	
Copper Tube	Electrical
Test may include but not limited to:	
Cooling/heating	Leakage
Critical Aspect	
<ul style="list-style-type: none"> • Demonstration of competencies in complying with safety regulation applicable to work site operation • Demonstration of competencies in installation of indoor and outdoor air condition units as per the manufacturer's specification • Demonstration of competencies in conducting of test following standard procedure 	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> • Ethics and Integrity • Occupational Health and Safety (OHS) Regulations • Basic electronic components • Environment rules and regulations • Environment hazards • Estimation and costing • Types and uses of personal protective equipment • Manufacturer's operation manuals and specifications • Types of AC • Working principle of AC • Working principles of heat pump 	<ul style="list-style-type: none"> • Team Work • Communication • Problem Solving • Interpersonal Relationship • Creativity • Innovation • Time Management

<ul style="list-style-type: none">• Basic electrical connections• Types of refrigerant	
---	--

UNIT TITLE	Carry Out Maintenance of Heat Pump/Air Conditioner and Automotive Air Conditioner
DESCRIPTOR	This unit covers the competencies required to troubleshoot, service domestic heat pump/ AC and automotive air conditioner following safety at all times
CODE	7127-U3-L2
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Prepare to Maintain Heat Pump/AC and Automotive air Conditioner	<p>1.1 Prepare PPE as per the job requirement following standard procedure</p> <p>1.2 Prepare tools and equipment as per the job requirement</p> <p>1.3 Estimate materials as per the job requirement following standard procedure</p> <p>1.4 Prepare work area following standard procedure</p>
2. Perform Preventive Maintenance of Heat Pump/Air Conditioner and Automotive Air Conditioner	<p>2.1 Observe occupational health and safety procedures</p> <p>2.2 Handle tools and equipment as per the job requirement</p> <p>2.3 Estimate materials as per the job requirement following standard procedure</p> <p>2.4 Prepare work area following standard procedure</p>

	<p>2.5 Perform periodic and routine servicing following standard procedure</p> <p>2.6 Complete the documentation following standard procedure</p>
3. Perform Corrective Maintenance of Heat Pump/Air Conditioner and Automotive Air Conditioner	<p>3.1 Handle tools and equipment as per the job requirement</p> <p>3.2 Observe Occupational Health and Safety Procedures</p> <p>3.3 Troubleshoot the faults following standards Procedure</p> <p>3.4 Estimate the cost of service following standard procedure</p> <p>3.5 Rectify the faulty electrical and mechanical components as per the job requirement following standard procedure</p> <p>3.6 Recover and charge the refrigerant following standard procedure in accordance with relevant rules and regulations</p>
4. Conduct Test	<p>4.1 Test the air conditioning units and automotive air conditioner for proper functioning following standard procedure</p> <p>4.2 Complete documentation following standard procedure</p>

	3.1 Apply 5S principles following standard procedure
--	--

RANGE STATEMENT	
PPE may include but not limited to:	
<ul style="list-style-type: none"> • Goggles • Mask • Gloves • Helmet • First Aid Box 	<ul style="list-style-type: none"> • Safety shoes • Uniform • Apron • Safety Harness
Tools and equipment may include but not limited to:	
<ul style="list-style-type: none"> • Drill machine • Tube cutter • Screw driver set • Multi meter • Pliers • Ladder 	<ul style="list-style-type: none"> • Flaring tools • Pressure gauge • Allen key set • Vacuum pump • Tube bender
Materials may include but not limited to:	
<ul style="list-style-type: none"> • Wires • Refrigerant • Brazing set 	<ul style="list-style-type: none"> • Copper Tubes • Dry Nitrogen gas
Faults may include but not limited to:	
<ul style="list-style-type: none"> • Electrical 	<ul style="list-style-type: none"> • Mechanical
Electrical components may include but not limited to:	

<ul style="list-style-type: none"> • Thermostat • Thermal sensor • Fuse • Relay • Solenoid valve 	<ul style="list-style-type: none"> • Capacitors • Contactor • Power circuit board • Transformer • Motor
Mechanical components may include but not limited to:	
<ul style="list-style-type: none"> • Evaporator • Condenser • Compressor • Reversing valve • Blower fan 	<ul style="list-style-type: none"> • Filter dryer • Copper Tubes • Accumulator • Expansion Valve
Test may include but not limited to:	
<ul style="list-style-type: none"> • Cooling • Heating 	<ul style="list-style-type: none"> • Leakage • Power
Documentation may include but not limited to:	
<ul style="list-style-type: none"> • Maintenance / service • record Job card 	<ul style="list-style-type: none"> • Bills

Critical Aspect
<ul style="list-style-type: none"> • Demonstration of compliance with safety regulation applicable to work site operation • Demonstration of competencies in troubleshooting and rectifying the faults following standards procedure

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> • Ethics and Integrity • Occupational Health & Safety • Basic First Aid • Basic electronics components • Basic retrofitting techniques • Manufacturer's operation manuals and specifications • Basic electrical connections • Working principles of AC • Types of AC • Working principles and components of automotive air conditioning system • Types of refrigerants • Environment hazards • Environment rules and regulations 	<ul style="list-style-type: none"> • Team Work • Communication • Problem Solving • Interpersonal Relationship • Creativity • Innovation • Time Management

ANNEXURE

National Competency Standards (NCS)

The National Competency Standards specify the skill, knowledge and attitudes applied to a particular occupation. Standards also specify the standards or criteria of performance of a competent worker and the various contexts in which work may take place. Standards provide explicit advice to assessors regarding the skill and knowledge to be demonstrated by candidates seeking formal recognition either following training or through work experience.

Purpose of National Competency Standards

National Competency Standards serve a number of purposes including:

- Providing advice to curriculum developers about the competencies to be included in the curriculum.
- Providing specifications to assessment resource developers about the competencies within an occupation to be demonstrated by candidates.
- Providing advice to industry/employers about job functions, which in turn can be used for the development of job descriptions, performance appraisal systems and work flow analysis.

Bhutan Qualifications Framework (BQF)

Bhutan Qualifications Framework is an integrated national framework that outlines all types of qualification in Bhutan. As an established and nationally accepted instrument, the BQF has been benchmarked against international practices in terms of standards. The BQF aims to recognize all forms of learning systems, including formal, non-formal, and informal learning. It

acknowledges technological advancements and recognizes contemporary modes of delivery. It covers a broad range of education systems including the TVET education.

Implementation of TVET Qualifications



*** RPL = Recognition of Prior Learning**

TVET Qualifications Levels

TVET Qualifications have seven levels as per the BQF as follows:

Bhutan Qualifications Framework 2023

Table 2: Qualification Types and Levels Based on Education Sector.

BQF Level	Community Education	School Education	TVET	Higher Education	Monastic Education
8				Doctoral Degree	<i>Khewang</i> མཁས་དབང་།
7			Master's Degree Postgraduate Diploma Postgraduate Certificate	Master's Degree Postgraduate Diploma Postgraduate Certificate	<i>Tsugla Gongma</i> གཞུག་ལག་ཤོང་མ།
6			Applied Degree	Bachelor's Degree Bachelor's Degree (Honours) Graduate Diploma Graduate Certificate	<i>Tsugla Wogma</i> གཞུག་ལག་འོག་མ།
5			Advanced Diploma	Advanced Diploma	
4			Diploma	Diploma	
3		Bhutan Higher Secondary Education Certificate	Certificate 3		<i>Dringrim Gongma</i> འགྲིང་རིམ་གོང་མ།
2		Bhutan Certificate for Secondary Education	Certificate 2		<i>Dringrim Barma</i> འགྲིང་རིམ་བར་མ།
1	ALC		Certificate 1		

Level Descriptors

The TVET Qualification levels are set based on the level descriptors, as defined in the BQF. The detail of the qualification level descriptor is as follow:

Level	<i>Knowledge</i>	<i>Skills</i>	<i>Values</i>	<i>Application</i>
	<i>Knowledge that is:</i>	<i>Demonstrate skills that involve:</i>	<i>Demonstrate values that involve:</i>	<i>Applied in contexts that involve:</i>
4	Broad theoretical, technical and operational	<p>Selecting and applying a range of standard processes relevant to varied and sometimes unpredictable tasks</p> <p>Selecting and applying a range of solutions involving formulation of solutions to resolve complex issues</p> <p>Demonstrating a high level of proficiency in English and Dzongkha</p>	<p>Strong level of awareness of self and others; and an appreciation of belief system, role of social norms, and the importance of relationship building</p> <p>Application of ethical norms and legal rules in decision-making; and comprehending the correlation between values and behavior</p>	<p>Stable tasks with predictable changes</p> <p>Broad guidance with some self-direction that requires sound judgement</p> <p>Taking some responsibility for planning and coordination with others</p>

			Commitment to own profession and quality of work	
3	Theoretical with some technical and operational processes	<p>Applying a range of standard processes to known but varied tasks</p> <p>Selecting and applying a range of solutions to familiar and unfamiliar problems</p> <p>Communicating effectively and clearly, both oral and written, in both English and Dzongkha</p>	<p>Sound level of self-awareness and beliefs; and ability to apply social norms and build relationships</p> <p>Application of a set of ethical norms</p> <p>Commitment to own field of interest and apply self-management of learning and performance</p>	<p>Stable tasks with some aspects of change</p> <p>General guidance and supervision that require discretion and judgement</p> <p>Adapting to own behaviour to work with others</p>
2	Basic, factual and conceptual	<p>Applying standard processes relevant to carry out known tasks</p> <p>Applying a set of known solutions to solve simple and</p>	<p>Some level of self-awareness and beliefs, and appreciation of social norms; and</p>	<p>Structured and stable tasks</p> <p>General support and Supervision that require some discretion</p>

		<p>straightforward issues</p> <p>Using simple and direct exchange of information on familiar and routine matters</p> <p>Developing basic proficiency in Dzongkha and English</p>	<p>significance of relationships</p> <p>Awareness of ethical norms, and openness to different activities</p> <p>Developing own knowledge and skills</p>	<p>and judgement</p> <p>Collaboration with others to achieve goals</p>
1	Foundational , every day and general	<p>Applying operational literacy, numeracy skills required to carry out simple tasks</p> <p>Applying simple solutions to solve simple and straightforward everyday issues</p> <p>Communicating using everyday expressions and simple phrases in Dzongkha and English</p>	<p>Basic awareness of self, beliefs, and social norms; and understand the significance of relationships</p> <p>Basic awareness of fundamental ethical norms, basic civil rights, and responsibilities</p>	<p>Highly structured tasks with close support and supervision</p> <p>Minimal Discretion and judgement</p> <p>Readiness to work together and share knowledge with others</p>

			Willingness to understand tasks and motivated to implement them successfully	
--	--	--	--	--

CODING USED FOR NATIONAL COMPETENCY STANDARDS

The coding and classification system developed in Bhutan is logical, easy to use, and also aligned with international best practices. The Bhutanese coding and classification system is based on the International Standard Classification of Occupations, 2008 (ISCO-08) developed by the International Labour Organisation (ILO). The coding of the National competency standards forms the basis of the identification code for the Vocational Education and Training Management Information System (VET – MIS) both in terms of economic sector identification and that of the individual standard.

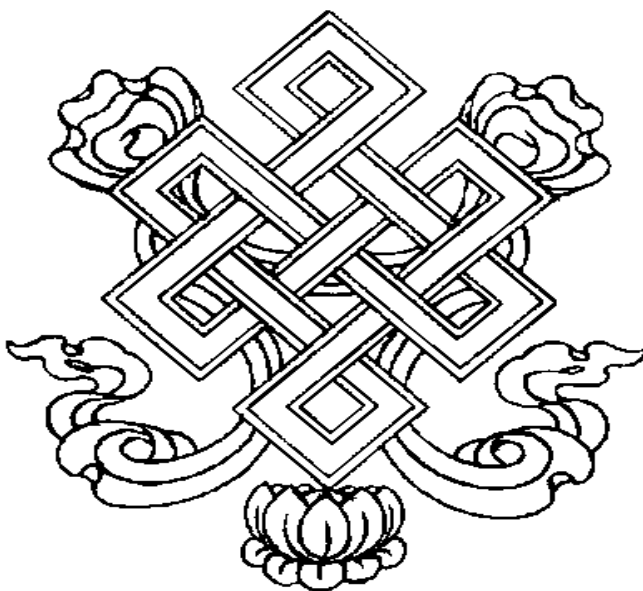
Coding the individual national competency standards

Coding the individual skills standard has a multiple purpose:

- to identify the level,
- to identify to which module the standard belongs,
- to identify in which order the standard is clustered within that module.

A job can include a number of competencies described in the national competency standards.

However, in order to follow a logical order, only national competency standards related to each other and following a logical sequence in terms of training delivery, from the simple to the complex, are clustered into a module. Some standards are so complex that they need to stand alone.



TVET Quality Council
Bhutan Qualifications and Professionals Certification Authority
Chang Gidaphu
P.O. Box 1956, Thimphu
www.bqpca.gov.bt