



**NATIONAL COMPETENCY STANDARDS
FOR
FACILITY MANAGEMENT TECHNOLOGIST
(DIPLOMA)**

**TVET Quality Council
Bhutan Qualifications and Professional Certification
Authority
Thimphu, Bhutan.
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FOREWORD

The TVET Quality Council, BQPCA is pleased to present the National Competency Standards (NCS) for Facility Management Technologist, Diploma, which is developed in consultation with the industries 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 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 industries. 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

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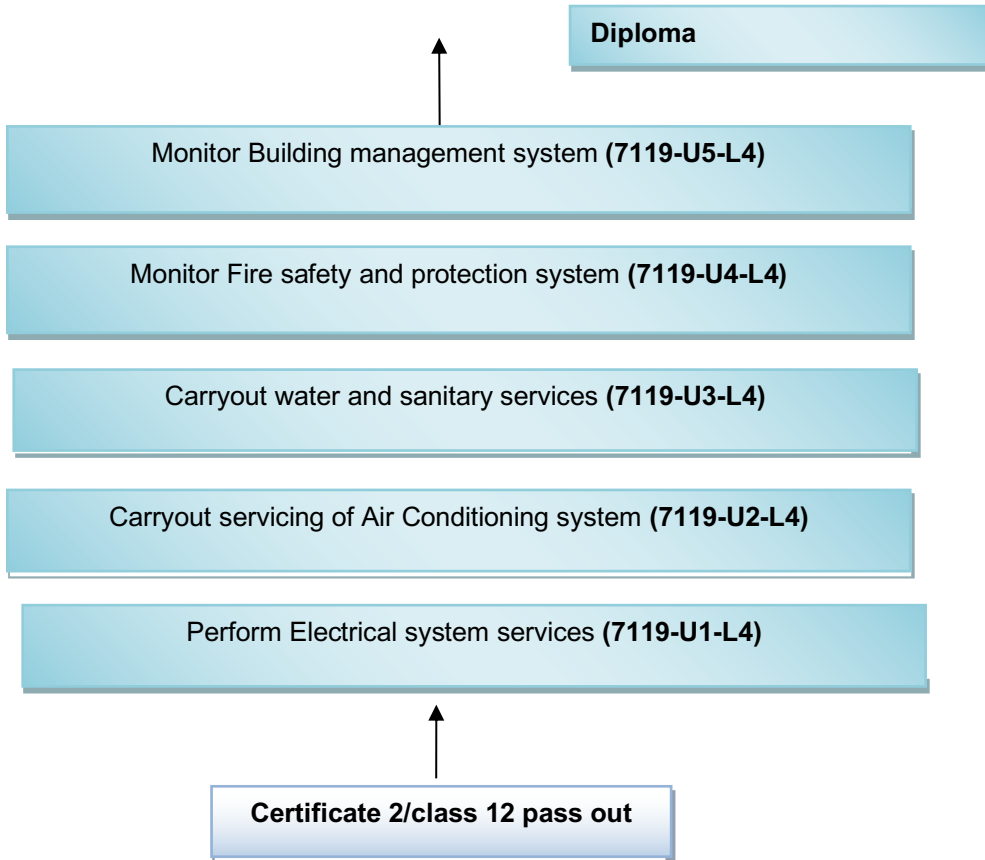
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PACKAGING OF QUALIFICATIONS



Overview of National Competency Standards

UNIT TITLE	ELEMENTS OF COMPETENCE
1. Perform Electrical System Services	1. Install electrical system 2. Service electrical system
2. Carryout servicing of Air Conditioning System	1. Install the air conditioning system 2. Service air conditioning system
3. Carryout Water and Sanitary Services	1. Install piping system 2. Service water, sanitary fittings and fixtures 3. Monitor water pump and control system
4. Monitor Fire Safety and Protection System	1. Inspect fire alarm safety and protection system 2. Install voice emergency communication system
5. Monitor Building Management System	1. Inspect building system faults 2. Prepare inspection report

UNIT TITLE :	Perform Electrical System Services
DESCRIPTOR :	This unit covers the competencies required to install and service electrical systems following safety procedures at all times.
CODE :	7119-U1-L4
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Install electrical system	<p>1.1 Identify and use Personal Protective Equipment as per the job requirement.</p> <p>1.2 Use tools and equipment as per the job requirement following standard procedures</p> <p>1.3 Interpret electrical circuit diagrams as per the job requirement following standard procedures</p> <p>1.4 Install lightning protection and earthing system as per the job requirement following standard procedures</p> <p>1.5 Install solar photovoltaic system as per the job requirement following standard procedures</p> <p>1.6 Install lighting and power circuits as per the job requirement following standard procedures</p> <p>1.7 Install backup power supply system as per the job requirement following standard procedures</p> <p>1.8 Conduct tests and commission as per the job requirement following standard procedures.</p> <p>1.9 Install basic power system as per the job requirement following standard procedures</p>
2. Service electrical system	<p>2.1 Determine the electrical system faults as per the job requirement following standard procedures</p>

	<p>2.2 Maintain the electrical system as per the job requirement following standard procedures</p> <p>2.3 Maintain solar PV system as per the job requirement following standard procedures</p> <p>2.4 Perform operation and maintenance of power system as per the job requirement following standard procedures</p> <p>2.5 Document the maintenance records following standard procedures</p>
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RANGE STATEMENT	
Personal Protective Equipment may include but not limited to:	
<ul style="list-style-type: none"> • Safety Shoe • Goggles • Helmet • Safety harness(full) • Ear plug 	<ul style="list-style-type: none"> • Work dress • Hand gloves • Florescent jacket • Mask
Tools and Equipment may include but not limited to:	
<ul style="list-style-type: none"> • Screw driver • Multi-meter • Pliers 	<ul style="list-style-type: none"> • IR tester • LCR meter
Backup power supply system may include but not limited to:	
<ul style="list-style-type: none"> • UPS 	<ul style="list-style-type: none"> • Generator set
Electrical system faults may include but not limited to:	
<ul style="list-style-type: none"> • Short circuit • Over load 	<ul style="list-style-type: none"> • Earth fault

Critical Aspects:

- Demonstration of occupational health and safety practices at workplace.
- Diagnosis and servicing of electrical system following safety procedures.

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none">• Ethics and Integrity• OHS regulations• First Aid• AC and DC Electrical Quantities (Power, Voltage, Current, Energy, Frequency)• Terminology of an AC sinusoidal wave form• Basic electrical theory<ul style="list-style-type: none">❖ DC circuits<ul style="list-style-type: none">✓ Series circuit✓ Ohms law✓ Parallel circuit✓ Kirchhoff's laws❖ AC circuits<ul style="list-style-type: none">✓ Pure R, Pure C, Pure L✓ Series and parallel (RL, RC, LC, RLC)✓ Star and Delta (Balance and unbalance)• Types of electrical diagrams and drawings (Layout diagram, single line diagram, block diagram, circuit diagram, schematic diagram and wiring diagram)	<ul style="list-style-type: none">• Team work• Communication• Negotiation• Patience• Creativity• Problem solving• Time management

<ul style="list-style-type: none"> • Code of practice for electrical installation • Electrical symbols and legends • Power/Distribution transformer, Instrument Transformer (Current and Voltage), Lightning arrester, wave trap, Capacitive Volt Transformer (CVT), Cables (PVC and XLPE), Relays, Circuit Breaker • Generation of electricity • Estimation and Costing • Relevant rules and regulations 	
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UNIT TITLE :	Carryout servicing of Air Conditioning System
DESCRIPTOR :	This unit covers the competencies required to install and service air conditioning system following safety procedures at all times.
CODE :	7119-U2-L4
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Install the air conditioning system	1.1 Identify and use <i>Personal Protective equipment</i> as per the job requirement 1.2 Use <i>tools and equipment</i> as per the job requirement standard procedures 1.3 Determine the capacity and number of AC following standard procedures 1.4 Prepare layout for the installation following standard procedures 1.5 Install indoor and outdoor units following standard procedures 1.6 Provide connections following standard procedures 1.7 Conduct test following standard procedures
2. Service air conditioning system	2.1 Troubleshoot the faults following standard procedures 2.2 Perform servicing of central air conditioning system as per the job requirement following standard procedures 2.3 Repair or replace faulty electrical and mechanical components as per the job requirement following standard procedures 2.4 Charge the refrigerant following standard procedures

	2.5 Conduct test for functioning following standard procedures 2.6 Maintain records as per the job requirement
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RANGE STATEMENT	
Personal Protective Equipment may include but not limited to:	
<ul style="list-style-type: none"> • Safety Shoe • Goggles • Helmet • Ear plug 	<ul style="list-style-type: none"> • Work dress • Hand gloves • Mask
Tools and Equipment may include but not limited to:	
<ul style="list-style-type: none"> • Screw driver set • Multi meter • Pliers • Pinching plier • Allen key set • Vacuum pump • Pipe cutter 	<ul style="list-style-type: none"> • Pressure gauge • Tester • Blow lamp • Recovery machine/cylinder
Critical Aspects:	
<ul style="list-style-type: none"> • Demonstration of occupational health and safety practices at workplace • Diagnosis and servicing of air conditioning system following standard procedures 	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> • Ethics and Integrity • OHS regulations • First Aid • Basic Electrical connections • Basic Electronic components • Working principles of Central heating systems • Types of AC • Types of refrigerants • Impact of refrigerants • Estimation and costing • Waste Management 	<ul style="list-style-type: none"> • Team work • Communication • Negotiation • Patience • Creativity • Problem solving • Time management

UNIT TITLE :	Carryout Water and Sanitary Services
DESCRIPTOR :	This unit covers the competencies required to install piping system, service water, sanitary fittings and fixtures and monitor water pump and control systems following safety procedures at all times.
CODE :	7119-U3-L4
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Install piping system	<p>1.1 Identify and use Personal Protective equipment as per the job requirement.</p> <p>1.2 Use tools and equipment as per the job requirement following standard procedures</p> <p>1.3 Fabricate piping system as per the job requirement following standard procedures</p> <p>1.4 Lay soil and wastepipe and fittings as per the job requirement following standard procedures</p> <p>1.5 Install sanitary fixtures and fittings as per the job requirement following standard procedures</p> <p>1.6 Perform test as per the job requirement following standard procedures</p>
2. Service water, sanitary fittings and fixtures	<p>2.1 Interpret relevant information relating to piping system as per the job requirement following standard procedures</p> <p>2.2 Diagnose the faults as per the job requirement following standard procedures</p> <p>2.3 Isolate electrical supply before replacement of faulty shower following standard procedures</p> <p>2.4 Repair/replace fittings and fixtures as per the job requirement following standard procedures</p>

	2.5 Test and commission the water supply system following standard procedures
3. Monitor water pumps and control system	3.1 Interpret relevant information following standard procedures 3.2 Diagnose the faults as per the job requirement following standard procedures 3.3 Inspect water pump and control system following standard procedures 3.4 Inspect water tanks following standard procedures 3.5 Inspect for leakages in the pipelines following standard procedures 3.6 Test and commission water pumping system following standard procedures 3.7 Document the records following standard procedures

RANGE STATEMENT	
Personal Protective Equipment may include but not limited to:	
<ul style="list-style-type: none"> • Safety Shoe • Goggles • Helmet • Ear plug 	<ul style="list-style-type: none"> • Work dress • Hand gloves • Mask
Tools and Equipment may include but not limited to:	
<ul style="list-style-type: none"> • Measuring Tape • Monkey Wrench • Pipe Wrench • Chain Wrench • Reamer • Blow Lamp • Heating Plate • Chalk 	<ul style="list-style-type: none"> • Cutter or Hacksaw • Hammer • Spirit Level or Water Level • Adjustable Wrench • Plumb Bob • Die set or Ratchet • Chisel • Files

<ul style="list-style-type: none"> • Pipe • Pressure Testing Equipment • Drilling Machine • Pipe Vice 	<ul style="list-style-type: none"> • Screw Driver
Sanitary fittings and fixtures may include but not limited to:	
<ul style="list-style-type: none"> • Multi-floor-Trap • Bottle Trap • Nahani Trap • Sink • One-pipe flushing system, Siphoning 	<ul style="list-style-type: none"> • P-trap • S-Trap • Q-Trap • Water closet • Two-pipe flushing system, Siphoning
Faults may include but not limited to:	
<ul style="list-style-type: none"> • Leakage • Breakage 	<ul style="list-style-type: none"> • Blockage • Pump rating
Critical Aspects:	
<ul style="list-style-type: none"> • Demonstration of occupational health and safety practices at workplace • Diagnose and service water and sanitary system following safety procedures 	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> • Ethics and Integrity • OHS regulations • First Aid • Types of pipes and fittings • Types of sanitary fixtures and fittings • Color code used in water supply system • Estimation and costing 	<ul style="list-style-type: none"> • Team work • Communication • Negotiation • Patience • Creativity • Problem solving • Time management

UNIT TITLE :	Monitor Fire Safety and Protection System
DESCRIPTOR :	This unit covers the competencies required to inspect fire alarm safety and protection system and install voice emergency communication system following safety at all times.
CODE :	7119-U4-L2
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Inspect fire alarm safety and protection system	1.1 Identify and use Personal Protective Equipment as per the job requirement. 1.2 Use tools and equipment following standard procedures 1.3 Interpret layout diagram following standard procedures 1.4 Diagnose the faults following standard procedures 1.5 Conduct the test for proper functioning of protection system components following standard procedures 1.6 Document the records following standard procedures 1.7 Integrate emergency escape lighting system following standard procedures
2. Install the voice emergency communication system	2.1 Install one way communication system following standard procedures 2.2 Install two-way communication system following standard procedures 2.3 Test the communication system following standard procedures

RANGE STATEMENT	
Personal Protective Equipment may include but not limited to:	
<ul style="list-style-type: none"> • Safety Shoe • Goggles • Helmet 	<ul style="list-style-type: none"> • Work dress • Fire safety suits • Hand gloves • Ear plug
Protection system components may include but not limited to:	
<ul style="list-style-type: none"> • Fire alarm and detection system • Hose reel system • Riser system 	<ul style="list-style-type: none"> • Fire hydrant system • Automated sprinkler system
Critical Aspects:	
<ul style="list-style-type: none"> • Demonstration of occupational health and safety practices at workplace • Diagnosis and service fire safety and protection system following standard procedures 	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> • Ethics and Integrity • OHS regulations • First Aid • Functions, construction and operation of fire detecting and alarm panels, break glass manual call point, Audible and visual sounders • Flame Detectors (UV type and IR type) • Heat detectors (Fixed temperature, rate- of- rise type) • Smoke detectors (photoelectric type, Ionization type) • Types of portable fire extinguishers • Relevant rules and regulations 	<ul style="list-style-type: none"> • Team work • Communication • Negotiation • Patience • Creativity • Problem solving • Time management

UNIT TITLE :	Monitor Building Management System
DESCRIPTOR :	This unit covers the competencies required to inspect building system faults and prepare inspection report following safety at all times.
CODE :	7119-U5-L4
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Inspect building system faults	1.1 Identify and use <i>Personal Protective Equipment</i> as per the job requirement. 1.2 Use tools and equipment following standard procedures 1.3 Interpret building control system as per the job requirement following standard procedures 1.4 Conduct control system wellness check following standard procedures 1.5 Manage common causes of faults of various control system following standard procedures
2 Prepare inspection report	2.1 Generate the report from the control system following standard procedures 2.2 Analyze the data for calibration and adjustment following standard procedures 2.3 Maintain the documents as per the job requirement following standard procedures

RANGE STATEMENT	
Personal Protective Equipment may include but not limited to:	
<ul style="list-style-type: none"> • Safety Shoe • Goggles • Helmet • Ear Plug 	<ul style="list-style-type: none"> • Work dress • Hand gloves • Mask
Critical Aspects:	
<ul style="list-style-type: none"> • Demonstration of occupational health and safety practices at workplace • Conduct control system wellness check following standard procedures 	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> • Ethics and Integrity • OHS regulations • First Aid • Building Management System (BMS) • Types of controls and controllers • Architecture and key components of BMS • BMS wellness checking procedures 	<ul style="list-style-type: none"> • Team work • Communication • Negotiation • Patience • Creativity • Problem solving • 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

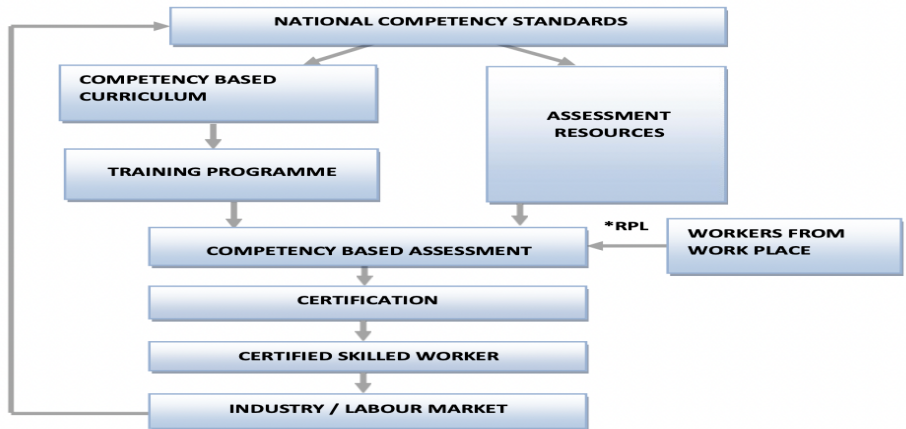
National Competency Standards serve a number of purposes including:

- 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 has seven levels as per the BQF. The levels are:

Master's Degree: Level 7

Applied Degree: Level 6

Advanced Diploma: Level 5

Diploma: Level 4

Certificate 3

Certificate 2

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:

Diploma

Skills	Knowledge	Application
<ul style="list-style-type: none">• Selecting and applying a range of standard processes relevant to varied and sometimes unpredictable tasks.• Selecting and applying a range of solutions involving formulation of solutions to resolve complex issues.• Demonstrating a high level of proficiency in English and Dzongkha.	<ul style="list-style-type: none">• Broad theoretical, technical and operational.	<ul style="list-style-type: none">• Stable tasks with predictable changes• Broad guidance with some self- direction that require sound judgement.• Taking some responsibility for planning and coordination with others.

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 Organization (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.

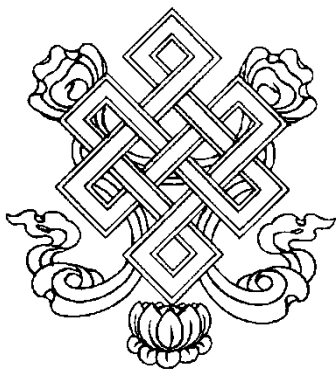
Coding the individual national competency standards

Coding the individual skills standard has a multiple purpose:

- to identify the occupational code
- to identify the units
- to identify the qualification level

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 qualification level. Some standards are so complex that they need to stand alone.



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