NATIONAL COMPETENCY STANDARDS
FOR
HYDROPOWER ELECTRICAL TECHNICIAN
(CERTIFICATE 3)

HYDROPOWER SECTOR

TECHNICAL & VOCATIONAL EDUCATION AND TRAINING QUALITY COUNCIL
BHUTAN QUALIFICATIONS AND PROFESSIONALS CERTIFICATION AUTHORITY
THIMPHU, BHUTAN
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FOREWORD

The TVET Quality Council, BQPCA, is pleased to present the National Competency Standards (NCS) for Hydropower Electrical Technician, Certificate 3, developed in collaboration with industry experts and trainers. These standards establish a nationally recognized qualification aligned with international best practices, setting a benchmark for TVET qualifications in Bhutan.

The NCS ensures that trainees acquire the necessary skills, knowledge, and attitude required by industries. Developed through close consultation with experts, it enhances the relevance of training to labor market needs, equipping graduates to meet industry expectations and improving their employability. A strong and responsive TVET system will also make vocational education more attractive to youth.

The Council acknowledges the valuable contributions of industry experts and trainers in the development of these standards. We urge employers and training providers to continue their support in implementing the NCS, fostering a skilled and productive workforce that contributes to national socio-economic development. Moving forward, we look forward to enhanced industry engagement and collaborative efforts in building a quality-assured, demand-driven TVET system.

Director
BQPCA

ACKNOWLEDGEMENT

Date of Endorsement : 31 July 2025
Date of Revision : 30 July 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 development of the National Competency Standards for Hydropower Electrical Technician:

Experts involved in the development of NCS			
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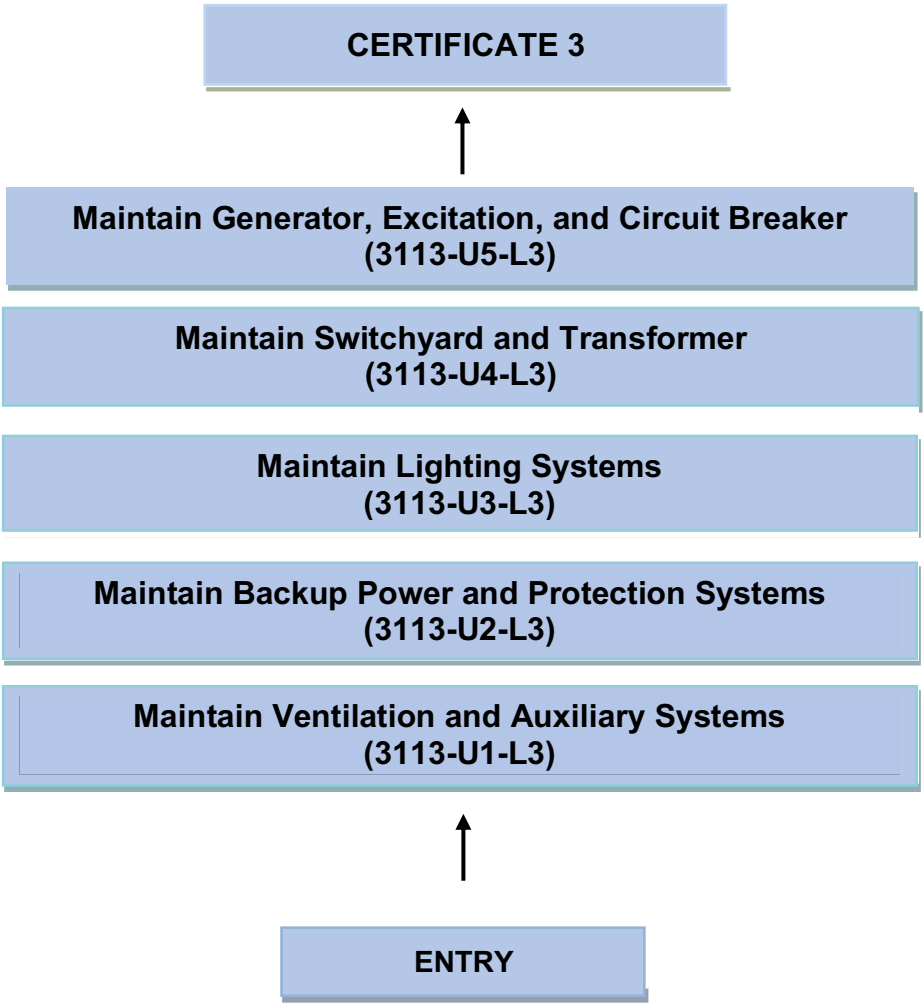
PACKAGING OF QUALIFICATIONS



OVERVIEW OF THE NCS

Unit Title	Element of Competence
1. Maintain Ventilation and Auxiliary Systems	1. Plan for Maintenance works 2. Perform Ventilation System Maintenance 3. Service Electrical Motors and Auxiliary Components 4. Finalize and Document the Ventilation and Auxiliary Systems Maintenance
2. Maintain Backup Power and Protection Systems	1. Plan for Maintenance works 2. Service Battery Bank and DG Set 3. Service Protection System Components 4. Complete Backup and Protection Systems maintenance
3. Maintain Lighting Systems	1. Plan for Lighting Systems Maintenance 2. Install and Maintain Lighting Systems 3. Finalize and Test Lighting System Operations
4. Maintain Switchyard and Transformer	1. Plan for Switchyard and Transformer Maintenance 2. Service Conductors, Capacitive Voltage Transformers, Insulators, and Switches 3. Perform Transformer Maintenance and Testing 4. Complete Switchyard and Transformer Maintenance

5. Maintain Generator, Excitation, and Circuit Breaker	1. Plan for Generator, Excitation, and Circuit Breaker Maintenance 2. Perform Generator Maintenance 3. Service Excitation System Components 4. Service and Test Circuit Breakers 5. Complete Generator, Excitation, and Circuit Breaker maintenance

UNIT TITLE	Maintain Ventilation and Auxiliary Systems
DESCRIPTOR	This unit contains competencies required to maintain ventilation and auxiliary systems following standard procedure.
CODE	**3113-U1-L3**
ELEMENTS OF COMPETENCE	**PERFORMANCE CRITERIA**
1. Plan for Maintenance works	1.1 Refer technical manuals to identify tasks 1.2 Conduct risk assessments to ensure compliance with safety regulations 1.3 Gather required ***tools, equipment, PPEs and materials*** 1.4 Coordinate with team members to ensure resource availability 1.5 Verify system isolation procedures for safe working conditions.
2. Perform Maintenance of Ventilation System	2.1 Inspect ventilation components for wear, corrosion, or blockages 2.2 Clean or replace filters, ducts, and fan blades as per specifications 2.3 Test system performance to ensure optimal airflow and pressure 2.4 Lubricate moving parts to reduce friction and wear 2.5 Maintain work status in logbooks.

3. Service Electrical Motors and Auxiliary Components	3.1 Inspect motor windings, bearings, and connections for faults. 3.2 Perform cleaning and lubrication of motor components. 3.3 Test motor performance using multimeters and diagnostic tools. 3.4 Replace defective parts as per manufacturer specifications.
4. Finalize Maintenance of Ventilation and Auxiliary Systems	4.1 Conduct post-maintenance testing to confirm system functionality. 4.2 Re-energize systems following proper startup procedures. 4.3 Update maintenance logs and schedules for future tasks. 4.4 Communicate work status to supervisors.

RANGE STATEMENT	
PPEs may include but not limited to:	
• Safety boot • Hand gloves • Safety Helmet	• Work dress • Ear protection device
Tools and Equipment may include but not limited to:	
• Electrician tool set • Multimeter	• Megger • Soldering kit

Materials may include but not limited to:	
• Insulation tape • Markin Cloth	• Cleaning agents • Soldering material
Critical Aspects	
• Follow Safety at workplace • Follow standard procedure for all the tasks • Diagnosis of faults	

UNDERPINNING KNOWLEDGE	**UNDERPINNING SKILLS**
• Ethics and Integrity • OHS regulations • Basic first Aid • Basic electrical drawings, signs and symbols • Basic fundamentals of electricity • Fundamentals of ventilation system. • Types of electrical motors • Fundamentals of Electrical motor and auxiliary equipment. • Workplace safety, including lockout-tagout procedures and confined space protocols. • Types of maintenances.	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Time Management • Innovation

UNIT TITLE	Maintain Backup Power and Protection Systems
DESCRIPTOR	This unit contains competencies required to maintain backup power and protection systems following standard procedure.
CODE	3113-U2-L3
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Plan for Maintenance works	1.1 Refer technical drawings and maintenance schedules 1.2 Identify and mitigate hazards through risk assessments. 1.3 Collect ***tools, equipment, PPEs and materials*** 1.4 Coordinate with supervisor for shut down clearance. 1.5 Ensure compliance with environmental and safety regulations.
2. Service Battery Bank and Diesel Generator Set	2.1 Inspect battery terminals and electrolyte levels for corrosion or leaks. 2.2 Perform routine monitoring of ***Battery parameters*** 2.3 Perform maintenance on DG set, including fuel system checks and oil changes. 2.4 Replace faulty components in battery banks or DG sets.

3. Service Protection System Components	3.1 Inspect protection relays and sensors for proper functioning. 3.2 Replace defective protection components as needed. 3.3 Check the healthiness of fuses, auxiliary relays and components
4. Complete Backup and Protection Systems maintenance	4.1 Re-energize backup and protection systems following protocols. 4.2 Update system logs and maintenance schedules. 4.3 Brief supervisors on system status.

RANGE STATEMENT	
PPEs may include but not limited to:	
• Safety boot • Hand gloves • Safety Helmet	• Work dress • Ear protection device
Tools and Equipment may include but not limited to:	
• Electrician tool set • Multimeter • Hydrometer • Portable Blower	• Megger • Soldering kit • Cleaning brush
Materials may include but not limited to:	
• Cleaning agent • Soldering materials	• Markin cloth

Battery parameters may include but not limited to:	
• Voltage • Current	• Specific Gravity
Critical Aspects	
• Follow Safety at workplace • Follow standard procedure for all the tasks • Diagnosis of faults	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and Integrity • OSH regulations • Basic first Aid • Basic electrical drawings, signs and symbols • Basic fundamentals of electricity • Fundamentals of battery banks and diesel generators. • Functioning of protection system components, including relays and sensors. • Electrical safety protocols.	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Creativity • Time Management • Innovation

UNIT TITLE	Maintain Lighting Systems
DESCRIPTOR	This unit contains competencies required to maintain lighting systems.
CODE	3113-U3-L3
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Plan for Lighting Systems Maintenance	1.1 Refer technical drawings and maintenance schedules for lighting systems. 1.2 Conduct risk assessments to ensure safe work practices. 1.3 Gather ***tools, materials, and PPE*** for tasks. 1.4 Coordinate with supervisor to schedule maintenance activities. 1.5 Verify system isolation to prevent electrical hazards.
2. Install and Maintain Lighting Systems	2.1 Inspect lighting fixtures for damage or wear. 2.2 Replace bulbs, ballasts, or wiring as needed. 2.3 Test lighting system performance for brightness and coverage. 2.4 Follow electrical codes and standards. 2.5 Maintain log book for the activities carried out.
3. Finalize and Test Lighting System Operations	3.1 Conduct final testing of lighting. 3.2 Re-energize systems following proper procedures.

	3.3 Update maintenance system logs. 3.4 Communicate work status to supervisor.

RANGE STATEMENT	
PPEs may include but not limited to:	
• Safety boot • Hand gloves • Safety Helmet	• Work dress • Safety Belts • Ear Protection
Tools and Equipment may include but not limited to:	
• Electrician tool set • Multimeter • Sky Jacker	• Ladder • Test lamp
Materials may include but not limited to:	
• Insulation Tape • Electrical Fittings	• Wires • Markin cloth
Critical Aspects	
• Follow Safety at workplace • Follow standard procedure for all the tasks • Verify system isolation to prevent electrical hazards.	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and Integrity • Occupational Health and Safety regulations • Basic first Aid • Basic electrical drawings, signs and symbols • Basic fundamentals of electricity • Basic design and operation of lighting systems. • Electrical codes and standards for lighting installations. • Use of testing equipment for lighting.	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Time Management • Innovation

UNIT TITLE	Maintain Switchyard and Transformer
DESCRIPTOR	This unit contains competencies required to maintain switchyard and transformer following standard procedure.
CODE	3113-U4-L3
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Plan for Switchyard and Transformer Maintenance	1.1 Refer maintenance plans and technical drawings for switchyard and transformer. 1.2 Conduct risk assessments to identify hazards. 1.3 Gather ***tools, equipment, PPE*** and ***Materials*** 1.4 Coordinate with supervisor for system isolation. 1.5 Ensure compliance with safety and environmental standards.
2. Service Conductors, Capacitive Voltage Transformers, Insulators, and Switches	2.1 Inspect switchyard components for wear, corrosion, or damages. 2.2 Clean or replace conductors, insulators, and switches as needed. 2.3 Verify connections for optimal performance. 2.4 Document maintenance activities.

3. Perform Transformer Maintenance	3.1 Inspect transformer components and oil levels. 3.2 Check the condition of connection points 3.3 Clean or replace faulty transformer components. 3.4 Record maintenance activities.
4. Complete Switchyard and Transformer Maintenance	4.1 Conduct final checking to confirm switchyard and transformer maintenance. 4.2 Coordinate with operators for systems restoration following proper protocols. 4.3 Update maintenance system logs. 4.4 Report work status to supervisors.

RANGE STATEMENT	
PPEs may include but not limited to:	
• Safety boot • Hand gloves • Safety Helmet	• Work dress • Safety Belts • Ear Protection
Tools and Equipment may include but not limited to:	
• Tool set • Multimeter • Ladder • Electric Oven	• Megger • Temporary earthing tools • Sky Jacker
Materials may include but not limited to:	

• Markin cloth • Cleaning agent	• Transformer oil • Silica Gel
Critical Aspects	
• Follow Safety at workplace • Follow standard procedure for all the tasks • Providing temporary earthing	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and Integrity • Occupational Health and Safety regulations • Basic first Aid • Basic electrical drawings, signs and symbols • Basic fundamentals of electricity • Basic fundamentals of switchyard and transformers. • Electrical safety protocols and isolation procedures. • Basic transformer oil analysis and testing. • Use of diagnostic and testing equipment for switchyard and transformers.	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Time Management • Innovation

UNIT TITLE	Maintain Generator, Excitation and Circuit Breaker
DESCRIPTOR	This unit contains competencies required to maintain generator, excitation and circuit breaker
CODE	3113-U5-L3
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Plan for Generator, Excitation, and Circuit Breaker Maintenance	1.1 Refer maintenance plans and technical parameters for generators, excitation systems, and circuit breakers. 1.2 Conduct risk assessments to identify and mitigate hazards. 1.3 Gather ***tools, equipment, and PPE*** for maintenance tasks. 1.4 Coordinate with supervisor for system isolation. 1.5 Ensure compliance with safety and environmental regulations.
2. Perform Generator Maintenance	2.1 Inspect generator components, including rotors and stators, for wear or damages. 2.2 Perform cleaning and lubrication of generator parts. 2.3 Replace faulty components as per manufacturer specifications. 2.4 Document maintenance activities.

3. Service Excitation System Components	3.1 Check excitation system components for functionality and wear. 3.2 Replace defective excitation components as needed. 3.3 Record maintenance activities.
4. Service and Test Circuit Breakers	4.1 Inspect circuit breakers for wear, corrosion, or mechanical faults. 4.2 Perform cleaning and lubrication of breaker components. 4.3 Replace faulty breaker parts as per specifications. 4.4 Record maintenance activities.
5. Complete Generator, Excitation, and Circuit Breaker maintenance	5.1 Collaborate with operator to normalize the systems following proper startup protocols. 5.2 Update maintenance work status logs. 5.3 Communicate work status to supervisors.

RANGE STATEMENT	
PPEs may include but not limited to:	
• Safety boot • Hand gloves • Safety Helmet	• Work dress • Ear Protection • Face Mask
Tools and Equipment may include but not limited to:	

• Tool set • Multimeter • Gas welding set • Painting brush	• Megger • Temporary earthing tools • Air compressor • Spray Gun
Materials may include but not limited to:	
• Cleaning agent • Insulation materials • Soldering lead	• Markin cloth • Earth Brush • Painting materials
Critical Aspects	
• Follow Safety at workplace • Follow standard procedures for all the tasks • Diagnosis of faults	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and Integrity • Occupational Health and Safety regulations • Basic first Aid • Basic electrical drawings, signs and symbols • Basic fundamentals of electricity	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Time Management • Innovation

• Basic fundamentals of generator and excitation system operation. • Circuit breaker functionality and testing procedures. • Electrical safety and isolation protocols. • Use of diagnostic tools for generators and excitation systems.	

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

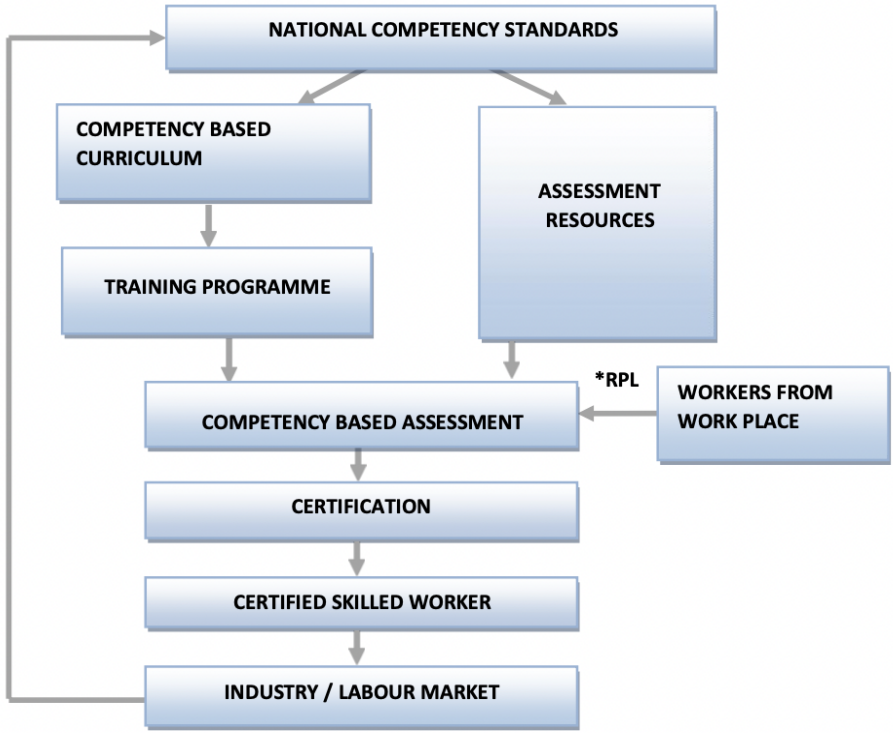
National Competency Standards serve a number of purposes including:

- 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	*Khewang* མཁས་དབང་།
7			Master's Degree Postgraduate Diploma Postgraduate Certificate	Master's Degree Postgraduate Diploma Postgraduate Certificate	*Tsugla Gongma* གསུགས་ཨག་གོང་མ།
6			Applied Degree	Bachelor's Degree Bachelor's Degree (Honours) Graduate Diploma Graduate Certificate	*Tsugla Wogma* གསུགས་ཨག་འོག་མ།
5			Advanced Diploma	Advanced Diploma	
4			Diploma	Diploma	
3		Bhutan Higher Secondary Education Certificate	Certificate 3		*Dringrim Gongma* འབྲིང་རིམ་གོང་མ།
2		Bhutan Certificate for Secondary Education	Certificate 2		*Dringrim Barma* འབྲིང་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	Knowledge Knowledge that is:	Skills Demonstrate skills that involve:	Values Demonstrate values that involve:	Application Applied in contexts that involve:
4	Broad theoretical, technical and operational	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	Strong level of awareness of self and others; and an appreciation of belief system, role of social norms, and the importance of relationship building Application of ethical norms and legal rules in decision-making; and comprehending the correlation between values and behavior Commitment to own profession and quality of work	Stable tasks with predictable changes Broad guidance with some self-direction that requires sound judgement Taking some responsibility for planning and coordination with others
3	Theoretical with some technical and operational processes	Applying a range of standard processes to known but varied tasks Selecting and applying a range of solutions to familiar	Sound level of self-awareness and beliefs; and ability to apply social norms and	Stable tasks with some aspects of change General guidance and supervision that require

		and unfamiliar problems Communicating effectively and clearly, both oral and written, in both English and Dzongkha	build relationships Application of a set of ethical norms Commitment to own field of interest and apply self-management of learning and performance	discretion and judgement Adapting to own behaviour to work with others
2	Basic, factual and conceptual	Applying standard processes relevant to carry out known tasks Applying a set of known solutions to solve simple and straightforward issues Using simple and direct exchange of information on familiar and routine matters Developing basic proficiency in Dzongkha and English	Some level of self-awareness and beliefs, and appreciation of social norms; and significance of relationships Awareness of ethical norms, and openness to different activities Developing own knowledge and skills	Structured and stable tasks General support and Supervision that require some discretion and judgement Collaboration with others to achieve goals
1	Foundational, every day and general	Applying operational literacy, numeracy skills required to carry out simple tasks Applying simple solutions to solve simple and straightforward everyday issues	Basic awareness of self, beliefs, and social norms; and understand the significance of relationships Basic awareness of	Highly structured tasks with close support and supervision Minimal Discretion and judgement

		Communicating using everyday expressions and simple phrases in Dzongkha and English	fundamental ethical norms, basic civil rights, and responsibilities Willingness to understand tasks and motivated to implement them successfully	Readiness to work together and share knowledge 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 Organisation (ILO).The coding of the National competency standards forms the basis of the identification code for the Technical & Vocational Education and Training Management Information System (TVET – MIS) both in terms of economic sector identification and that of the individual standard.

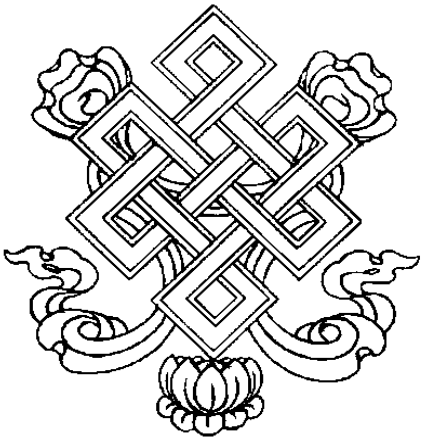
Coding the individual national competency standards

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.



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