

Table of Contents

Foreword.....	2
Acknowledgement	3
Packaging of Qualifications	4
Overview of the Unit Competencies	5
Annexures:	
1.1 National Competency Standards (NCS)	i
1.2 Purpose of National Competency Standards	i
1.3 Bhutan Vocational Qualifications Framework (BVQF).....	ii
1.4 BVQF Levels	iii
1.5 Coding used for National Competency Standards.....	v
1.6 Assessment Guide.....	v

FOREWORD

The Department of Occupational Standards of the Ministry of Labour and Human Resources proudly presents the National Competency Standards (NCS) for CNC Machinist as part of TVET reform initiative for improving the quality of Vocational Education and Training System in Bhutan. The standards represent the fruits of hard work and invaluable experiences gained by the department since its establishment in the latter half of 2003. The main aim of developing National Competency Standards is to set up a well-defined nationally recognized Vocational Qualification and Certification system that will help set a benchmark for the Technical Vocational Education and Training (VET) System in our country aligned to international best practices.

National Competency Standards is one of the base pillars in the Bhutan Vocational Qualification Framework (BVQF) and is the first step in its implementation. The standards are developed to ensure that employees or vocational graduates possess and acquire the desired skills, knowledge and attitude required by industries and employers. In order to ensure this close match in supply and demand of skills, knowledge and attitude, standards have been developed in close consultation and partnership with industry experts and trainers from training institutes.

A vocational education and training system based on National Competency Standards shall ensure that training is of a high quality and relevant to the needs of the labour market. As a result, future TVET graduates will be better equipped to meet the need and expectations of industries and employers. This positive impact on the employability of TVET graduates will enhance the reputation of vocational education and training and make it attractive to school leavers.

While acknowledging the existing level of cooperation and collaboration, the ministry earnestly requests employers and training providers to extend the fullest support and cooperation in developing or implementing 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 during the consultation and validation processes of the standards. I look forward to improved engagement and active participation of the industry and employers in the development of a quality assured demand driven TVET system in the near future.

Department of Occupational Standards,
Ministry of Labour and Human Resources

ACKNOWLEDGEMENT

Development Date : 21st September, 2022.

Endorsement date : 4th November, 2022

Date of Review : 4th November 2025 (max. 3 years).

Subject experts involved during the consultation workshop:

1. Tsheiring Gyeltshen, Assistant Lecturer, JWPTI, Gelephu
2. Kuenzang Chogyel, Instructor, JWPTI, Gelephu
3. Boj Raj Pokhral, Instructor, JWPTI, Gelephu
4. Sonam Dema, Instructor, TTI Khuruthang, Punakha
5. Roshna Rai, Asst.Instructor, TTI Khuruthang, Punakha
6. Pema Zangmo, Instructor, TTI Khuruthang, Punakha
7. Rinzin Norbu, Asst.Lecturer, TTI Khuruthang, Punakha
8. Ash Bdr.Subba, Instructor, TTI Khuruthang, Punakha

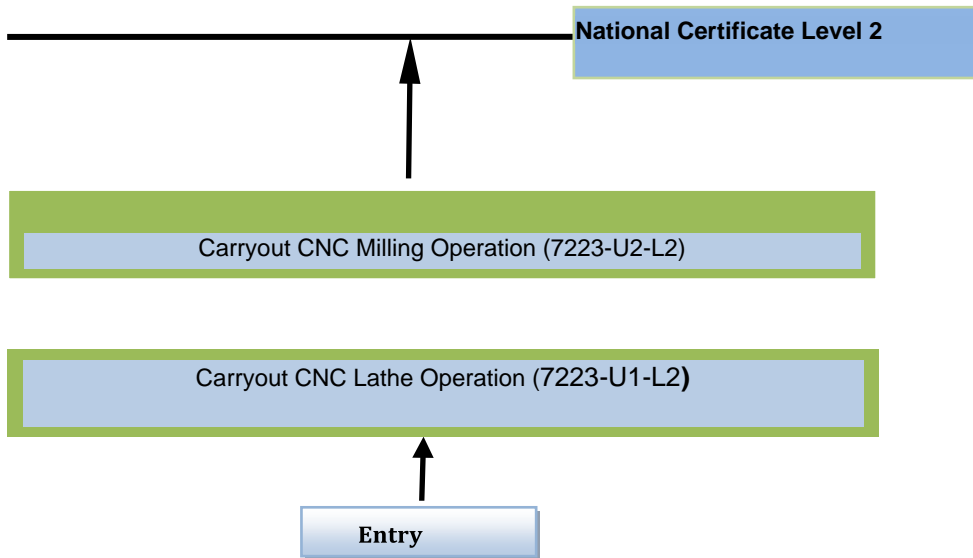
Field experts involved during the Consultation workshop:

1. Hem Raj Chhetri, Engineer, BHSL, Gelephu
2. Mangal Singh Rai, CNC Machinist, BHSL
3. Namgay Lhamo, CNC Machinist, BHSL

Development group (Facilitator):

1. Karma Loday, Specialist, Department of Occupational Standards (DOS), MoLHR, Thimphu.
2. Rinzin Namgay, Engineer, Department of Occupational Standards (DOS), MoLHR, Thimphu.

PACKAGING OF QUALIFICATIONS



OVERVIEW OF UNIT COMPETENCIES

National Certificate - Level 2

UNIT TITLE	ELEMENTS OF COMPETENCE
1. Carryout CNC Lathe Operation	1.1 Perform CNC Lathe machine setup 1.2 Perform CNC lathe programming 1.3 Carryout machining on CNC lathe machine 1.4 Perform product inspection
2. Carryout CNC Milling Operation	2.1 Perform CNC milling machine setup 2.2 Perform CNC milling programming 2.3 Carryout machining on CNC milling machine 2.4 Perform product inspection

UNIT TITLE	Carryout CNC Lathe Operation
DESCRIPTOR	This unit covers the competencies required to carryout CNC lathe machine setup, perform CNC lathe programming and perform CNC lathe operation
CODE	7223-U1-L2
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Perform CNC Lathe Machine Setup	<p>1.1 Use PPEs as per the job requirement following standard procedures</p> <p>1.2 Check the CNC machine as per the checklist following standard procedure</p> <p>1.3 Set machine reference as per the job requirements following standard procedures</p>
2. Perform CNC Lathe Programming	<p>2.1 Prepare engineering drawing as per the job requirements following standard procedures</p> <p>2.2 Perform CNC lathe programming as per engineering drawing following standard procedures</p> <p>2.3 Perform simulation of the written program following standard procedures</p>
3. Carryout Machining on CNC Lathe Machine	<p>3.1 Set up the work piece as per job requirement following standard procedures</p> <p>3.2 Set up cutting tools as per job requirement following standard procedures</p> <p>3.3 Perform machining on CNC lathe machine as per job requirement following standard procedures</p>

4. Perform Product Inspection	4.1 Use measuring instruments as per the job requirement following standard procedures. 4.2 Check the dimensions and geometry of the product as per the engineering drawing following standard procedures.
-------------------------------	---

RANGE STATEMENT	
PPEs may include but not limited to:	
<ul style="list-style-type: none"> • Safety Goggles • Safety Gloves • Safety Shoes • Work Dress 	<ul style="list-style-type: none"> • Helmet • Ear Plug • Apron
Checklist may include but not limited to:	
<ul style="list-style-type: none"> • Oil Level • Lubricant Level • Air Pressure 	<ul style="list-style-type: none"> • Coolant Level • Hydraulic Pressure
Set up may include but not limited to:	
<ul style="list-style-type: none"> • Mounting • Leveling 	<ul style="list-style-type: none"> • Truing • Offsetting
Machining may include but not limited to:	
<ul style="list-style-type: none"> • Facing • Turning • Drilling 	<ul style="list-style-type: none"> • Boring • Threading
Measuring instruments may include but not limited to:	
<ul style="list-style-type: none"> • Micrometer • Vernier caliper • Bore gauge • Depth gauge • Radius gauge 	<ul style="list-style-type: none"> • Pitch gauge • Bevel protector • Dial gauge • Ra tester

<p>Critical aspects:</p> <ul style="list-style-type: none"> • Demonstrate safe working practices at all times in accordance with OHS regulations • Perform CNC lathe programming as per engineering drawing • Set up the work piece as per the job requirement
--

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> • Ethics and Integrity • Occupational Health and Safety (OHS) Regulations • First Aid • Working principle of CNC machine • CNC lathe programming • Machining operation • Machining parameters • Measuring instruments • Lubricants and hydraulic oils 	<ul style="list-style-type: none"> • Team work • Negotiation • Communication skills • Problem solving • Analytical Skills • Time Management

UNIT TITLE	Carryout CNC Milling Operation
DESCRIPTOR	This unit covers the competencies required to perform CNC milling machine setup, perform CNC milling programming and perform CNC milling operation
CODE	7223-U2-L2
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Perform CNC Milling Machine Setup	<p>1.1 Use PPEs as per the job requirement following standard procedures</p> <p>1.2 Check the CNC machine as per the checklist following standard procedure</p> <p>1.3 Set machine reference as per the job requirements following standard procedures</p>
2. Perform CNC Milling Programming	<p>2.1 Prepare engineering drawing as per the job requirements following standard procedures</p> <p>2.2 Perform CNC milling programming as per engineering drawing following standard procedures</p> <p>2.3 Perform simulation of the written program following standard procedures</p>
3. Carryout Machining on CNC Milling Machine	<p>3.1 Set up the work piece as per job requirement following standard procedures</p> <p>3.2 Set up cutting tools as per job requirement following standard procedures</p> <p>3.3 Perform machining on CNC milling machine as per job requirement following standard procedures</p>

4. Perform Product Inspection	4.1 Use measuring instruments as per the job requirement following standard procedures 4.2 Check the dimensions and geometry of the product as per the engineering drawing following standard procedures
-------------------------------	---

RANGE STATEMENT	
PPEs may include but not limited to:	
<ul style="list-style-type: none"> • Safety Goggles • Safety Gloves • Safety Shoes • Work Dress 	<ul style="list-style-type: none"> • Helmet • Ear Plug • Apron
Checklist may include but not limited to:	
<ul style="list-style-type: none"> • Oil Level • Lubricant Level • Air Pressure 	<ul style="list-style-type: none"> • Coolant Level • Hydraulic Pressure
Set up may include but not limited to:	
<ul style="list-style-type: none"> • Mounting • Leveling 	<ul style="list-style-type: none"> • Truing • Offsetting
Machining may include but not limited to:	
<ul style="list-style-type: none"> • Face milling • Drilling • Profile milling • Gear cutting 	<ul style="list-style-type: none"> • Boring • Threading • Slotting • Chamfer milling
Measuring instruments may include but not limited to:	
<ul style="list-style-type: none"> • Micrometer • Vernier caliper • Bore gauge • Depth gauge • Plug gauge 	<ul style="list-style-type: none"> • Pitch gauge • Bevel protector • Dial gauge • Ra tester • Radius gauge

<p>Critical aspects:</p> <ul style="list-style-type: none"> • Demonstrate safe working practices at all times in accordance with OHS regulations • Perform CNC milling programming as per engineering drawing • Set up the work piece as per the job requirement
--

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> • Ethics and Integrity • Occupational Health & Safety • First Aid • Working principle of CNC machine • CNC milling programming • Machining operation • Machining parameters • Measuring instruments • Lubricants and hydraulic oils • Working Principle of Air Compressor 	<ul style="list-style-type: none"> • Team work • Negotiation • Communication skills • Problem solving • Analytical Skills • Time Management

Annexure:

1.1 National Competency Standards (NCS)

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.

1.2 Purpose of National Competency Standards

Competency Standards serve a number of purposes including:

- Providing advice to curriculum developers about the skill and knowledge to be included in curriculum.
- Providing specifications to assessment resource developers about the skill, knowledge and attitudes 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.

1.3 Bhutan Vocational Qualifications Framework (BVQF)

Bhutan Vocational Qualifications Framework is an agreed system of Assessing, Certifying and Monitoring nationally recognized qualifications for all learning in the VET sector against national standards, in training institutions, in the workplace, in schools or anywhere where learning takes place.

Components of the Bhutan Vocational Qualification Framework (BVQF)



* RPL = Recognition of Prior Learning

1.4 BVQF Levels

The Bhutan Vocational Qualifications Framework has three levels classified based on the competency of the skilled workers. The three levels are:

- National Certificate Level 3 (NC 3) -Master Craftsman
- National Certificate Level 2 (NC 2) -Craftsman
- National Certificate Level 1 (NC 1) -Semi Skilled Worker

BVQF Level Descriptors

The qualification levels are decided based on level descriptors. The detail of the qualification level descriptor is as follows:

National Certificate Level 1 (Semi skilled)

Carry out processes that:	Learning demand:	Responsibilities Which are applied:
<ul style="list-style-type: none">• Are narrow in range.• Are established and familiar.• Offer a clear choice of routine responses.• Involve some prioritizing of tasks from known solutions.	<ul style="list-style-type: none">• Basic operational knowledge and skill.• Utilization of basic available information.• Known solutions to familiar problems.• Little generation of new ideas.	<ul style="list-style-type: none">• In directed activity.• Under general supervision and quality control.• With some responsibility for quantity and quality.• With no responsibility for guiding others.

National Certificate Level 2 (Craftsman)

Carry out processes that:	Learning demand:	Responsibilities which are applied:
<ul style="list-style-type: none"> • Require a range of well-developed skills. • Offer a significant choice of procedures requiring prioritization. • Are employed within a range of familiar context. 	<ul style="list-style-type: none"> • Some relevant theoretical knowledge. • Interpretation of available information. • Discretion and judgment. • A range of known responses to familiar problems 	<ul style="list-style-type: none"> • In directed activity with some autonomy. • Under general supervision and quality checking. • With significant responsibility for the quantity and quality of output. • With some possible responsibility for the output of others.

National Certificate Level 3 (Master Craftsman)

Carry out processes that:	Learning demand:	Responsibilities which are applied:
<ul style="list-style-type: none"> • Requires a wide range of technical or scholastic skills. • Offer a considerable choice of procedures requiring prioritization to achieve optimum outcomes. • Are employed in a variety of familiar and unfamiliar contexts. 	<ul style="list-style-type: none"> • A broad knowledge base which incorporates some theoretical concepts. • Analytical interpretation of information. • Informed judgment. • A range of sometimes innovative responses to concrete but often unfamiliar problems. 	<ul style="list-style-type: none"> • In self-directed activity. • Under broad guidance and evaluation. • With complete responsibility for quantity and quality of output. • With possible responsibility for the output of others.

1.5 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 unit competency standard is to identify the level in qualification package to which it belongs.

While packaging, in order to follow a logical order, only 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 package.

1.6 ASSESSMENT GUIDE

Form of assessments

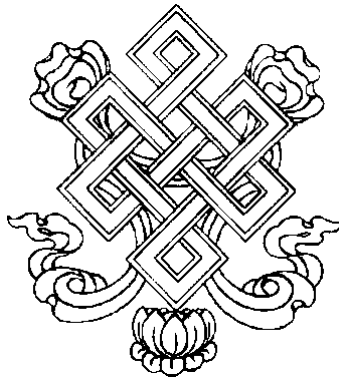
- Continuous assessment together with collected evidence of performance will be used.
- Evidence of the performance shall be based on practical demonstration.
- Knowledge can be assessed through diagrams, in writing or orally (viva- voce).

Assessment context

- Competency may be assessed in the actual work place or in a simulated workplace setting.

Assessment condition

- The candidate shall have access to all required tools, equipment, materials and documents.
- Candidate must complete the assessment in industry accepted time frame.



Department of Occupational Standards
Ministry of Labour & Human Resources
Thongsel Lam, Lower Motithang
P.O. Box 1036, Thimphu Tel:
02-331611 Fax: 02-326873
www.molhr.gov.bt