



First Publication 2016

First Revision 2022

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## Table of Contents

|   |    |
|---|----|
| Foreword.....   | 2  |
| Acknowledgement .....                                       | 3  |
| Packaging of Qualifications .....                           | 4  |
| Overview of the Unit Competencies .....                     | 5  |
| <b>Annexures:</b>   |    |
| 1.1 National Competency Standards (NCS) .....               | 16 |
| 1.2 Purpose of National Competency Standards .....          | 16 |
| 1.3 Bhutan Vocational Qualifications Framework (BVQF) ..... | 17 |
| 1.4 BVQF Levels .....                                       | 18 |
| 1.5 Coding used for National Competency Standards.....      | 20 |
| 1.6 Assessment Guide .....                                  | 20 |

## FOREWORD

The Department of Occupational Standards of the Ministry of Labour and Human Resources proudly presents the National Competency Standards (NCS) for Backhoe Operator 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. We 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** : 17<sup>th</sup> August, 2022.

**Endorsement Date** : 28<sup>th</sup> September, 2022

**Date of Review** : 28<sup>th</sup> August 2025 (max. 3 years).

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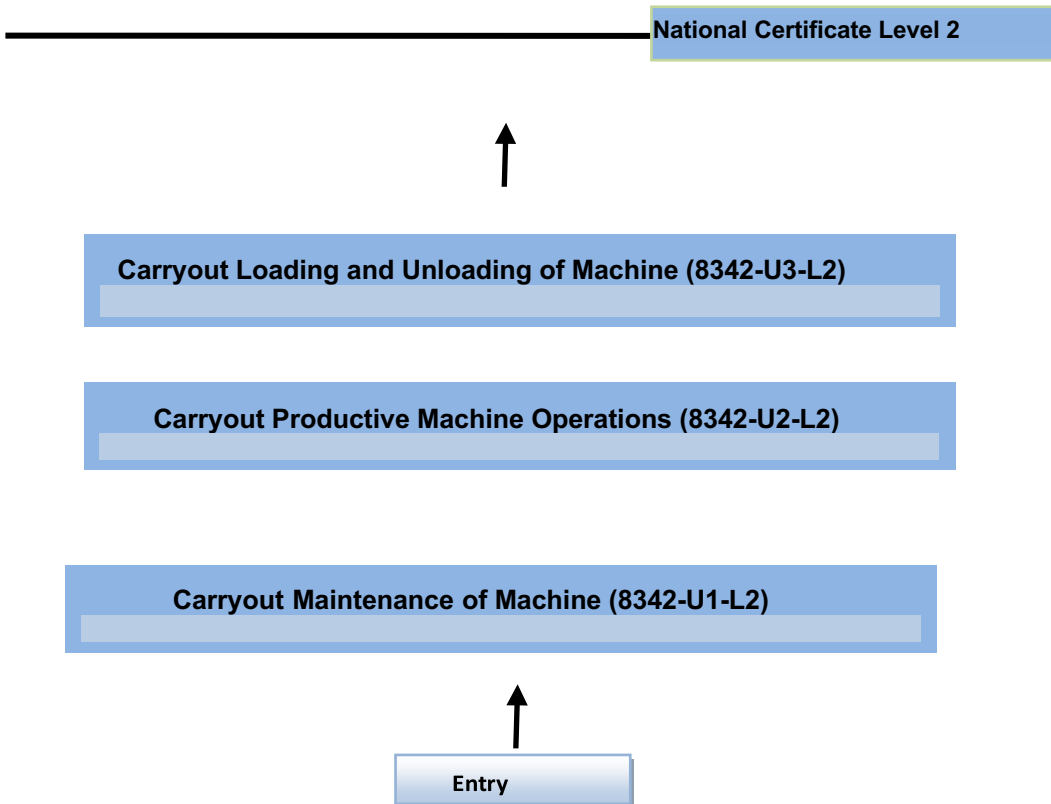
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## PACKAGING OF QUALIFICATIONS



## OVERVIEW OF UNIT COMPETENCIES

### National Certificate - Level 2

| UNIT TITLE                                | ELEMENTS OF COMPETENCE   |
|---|--|
| Carryout Maintenance of Machine           | <ol style="list-style-type: none"><li>1. Prepare for basic maintenance work</li><li>2. Perform periodic maintenance</li></ol>  |
| Carryout Productive Machine Operations    | <ol style="list-style-type: none"><li>1. Perform pre and post operation checks</li><li>2. Perform machine operation checks</li><li>3. Perform productive machine operation</li></ol> |
| Carryout Loading and Unloading of Machine | <ol style="list-style-type: none"><li>1. Prepare for loading and unloading</li><li>2. Perform loading of machines</li><li>3. Perform unloading of machines</li></ol>                 |

**UNIT TITLE** : **Carryout Maintenance of Machine**

**DESCRIPTOR:** This unit covers the competencies required to maintain machine following safety practices at all times of work operation.

**CODE** : **8342-U1-L2**

| <b>ELEMENTS OF COMPETENCE</b>         | <b>PERFORMANCE CRITERIA</b>   |
|---------------------------------------|---|
| 1. Prepare for basic maintenance work | 1.1 Identify <b>tools and equipment</b> as per the job requirement following standard procedures.<br>1.2 Identify <b>maintenance work</b> to be carried out following standard procedures.<br>1.3 Identify <b>materials</b> as per the job requirement following standard procedures.                     |
| 2. Perform periodic maintenance       | 2.1 Use <b>PPEs</b> as per the job requirement following standard procedures.<br>2.2 Change <b>oils</b> following procedures.<br>2.3 Change <b>fluids</b> following standard procedures.<br>2.4 Change the coolant following standard procedures.<br>2.5 Change fuel filter following standard procedure. |



## RANGE STATEMENT

### Materials may include but not limited to:

- Markin clothes
- Lubricants
- Rust remover
- Rugs
- Spare parts
- Grease

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

- Gloves
- Safety shoes
- Mask
- Goggles
- Field dress
- Helmets
- Ear plug
- Reflective jacket

### Maintenance works may include but not limited to:

- Service air filters
- Change Hoses
- Replace Bucket teeth
- Replace Site cutter
- Replace Fuses
- Service battery

### Tools and equipment may include but not limited to:

- Hand tool set
- Oil filter wrench
- SST
- Grease gun
- Hammer
- Screw driver set
- Allen key set
- Socket set
- Torque wrench

### Oils / Fluids and lubricants may include but not limited to:

- Engine Oil
- Transmission Oil
- Hydraulic Fluid
- Brake Fluid

### Critical aspects:

- Demonstrate compliance with safety regulation applicable to work site operation.
- Identify maintenance works.
- Perform maintenance work.

| UNDERPINNING KNOWLEDGE  | UNDERPINNING SKILLS  |
|---|--|
| <ul style="list-style-type: none"> <li>• Ethics and Integrity</li> <li>• Occupational Health and Safety (OHS) Regulations</li> <li>• First aid</li> <li>• Economic use of material</li> <li>• Types of maintenance</li> <li>• Importance of maintenance</li> <li>• Types of Oils / fluids and lubricants</li> <li>• Tools and equipment</li> <li>• Forms and reports</li> <li>• Manufacturer's specifications</li> <li>• Environment rules and regulations</li> <li>• Components of machines and its functions</li> </ul> | <ul style="list-style-type: none"> <li>• Team work</li> <li>• Communication</li> <li>• Problem solving</li> <li>• Interpersonal relationship</li> <li>• Creativity</li> <li>• Time Management</li> </ul> |

**UNIT TITLE** : **Carryout Productive Machine Operations**

**DESCRIPTOR:** This unit covers the competencies required to perform the actual productive operation of backhoe.

**CODE** : **8342-U2-L2**

| <b>ELEMENTS OF COMPETENCE</b>            | <b>PERFORMANCE CRITERIA</b>  |
|--|--|
| 1. Perform pre and post operation checks | 1.1 Use <b>PPEs</b> following standard procedures.<br>1.2 Conduct walks around inspection following standard procedures.<br>1.3 Check the levels of oils & lubricants and top up as per the job requirement following standard procedures.<br>1.4 Check for leakages and damages following standard procedures.<br>1.5 Maintain log book following standard procedure.                 |
| 2. Perform machine operation checks      | 2.1 Start the machine following standard procedures.<br>2.2 Check for leakages of fluids and lubricant following standard procedures.<br>2.3 Check the <b>functioning of machines</b> following standard procedures.   |
| 3. Perform machine operation             | 3.1 Perform marching of the machine following standard procedures.<br>3.2 Conduct work site inspection as per the job requirement following standard procedures.<br>3.3 Co-ordinate and communicate with authorized signalman during backhoe operations following standard procedure.<br>3.4 Perform <b>loader operation</b> as per the job requirement following standard procedures. |

|  |  |
|--|--|
|  | 3.5 Perform <b>backhoe operation</b> as per the job requirement following standard procedures. |
|--|--|

| <b>RANGE STATEMENT:</b>  |  |
|--|--|
| <b>Personal protective equipment (PPE) may include but not limited to:</b>   |  |
| <ul style="list-style-type: none"> <li>• Gloves</li> <li>• Safety shoes</li> <li>• Goggles</li> <li>• Reflective jacket</li> </ul> | <ul style="list-style-type: none"> <li>• Field dress</li> <li>• Helmets</li> <li>• Mask</li> <li>• Ear plug</li> </ul> |
| <b>Functioning of machines may include but not limited to:</b>   |  |
| <ul style="list-style-type: none"> <li>• Controls</li> </ul>   | <ul style="list-style-type: none"> <li>• Hydraulic System</li> </ul>   |
| <b>Loader operation may include but not limited to:</b>  |  |
| <ul style="list-style-type: none"> <li>• Dozing</li> <li>• Stockpiling</li> </ul>  | <ul style="list-style-type: none"> <li>• Loading</li> <li>• Landfilling</li> <li>• Grading</li> </ul>                  |
| <b>Backhoe operation may include but not limited to:</b>   |  |
| <ul style="list-style-type: none"> <li>• Trenching</li> <li>• Digging</li> <li>• Leveling</li> </ul>                               | <ul style="list-style-type: none"> <li>• Backfilling</li> <li>• Loading</li> <li>• Sloping</li> </ul>                  |

| <b>Critical Aspects:</b>   |
|--|
| <ul style="list-style-type: none"> <li>• Demonstrate compliance with safety regulation applicable to work site operation.</li> <li>• Respond efficiently and effectively to unexpected situations as per the job requirements following standard procedures.</li> <li>• Maintain coordination and communication with authorized signaller during machine operations.</li> <li>• Perform loader and backhoe operations effectively following standard procedures</li> </ul> |

| <b>UNDERPINNING KNOWLEDGE</b>   | <b>UNDERPINNING SKILLS</b>   |
|---|--|
| <ul style="list-style-type: none"> <li>• Ethics and Integrity</li> <li>• Occupational Health &amp; Safety Regulations</li> <li>• Risks and hazards during operation</li> <li>• Basic First Aid</li> <li>• Manufacturer's specifications</li> <li>• Environment rules &amp; regulations</li> <li>• Traffic rules and regulations</li> <li>• Estimation &amp; costing</li> <li>• Land management &amp; Soil structure</li> <li>• Operation manual</li> <li>• Basic working principles of hydraulic system and its components</li> </ul> | <ul style="list-style-type: none"> <li>• Team work</li> <li>• Communication</li> <li>• Problem solving</li> <li>• Interpersonal relationship</li> <li>• Creativity</li> <li>• Time Management</li> </ul> |

**UNIT TITLE : Carryout Loading and Unloading of Machine**

**DESCRIPTOR:** This unit covers the competencies required to carry out loading and unloading of machine ensuring safety at all times of operation.

**CODE : 8342-U3-L2**

| <b>ELEMENTS OF COMPETENCE</b>         | <b>PERFORMANCE CRITERIA</b>   |
|---------------------------------------|---|
| 1. Prepare for loading and unloading. | 1.1 Use PPEs following standard procedures.<br>1.2 Check the loading capacity and the condition of truck as per the job requirement following standard procedures.<br>1.3 Prepare the loading ramp as per the job requirement following standard procedure.<br>1.4 Ensure the truck is <b>positioned securely</b> as per the job requirement following standard procedures.   |
| 2. Perform loading of machine.        | 2.1 Position the machine for loading following standard procedures.<br>2.2 Load the machine following standard procedures.<br>2.3 Position arms and bucket properly in accordance with safe working procedures.<br>2.4 Secure the machine after loading as per the job requirements following standard procedures.<br>2.5 Use safety tag following standard procedures.<br>2.6 Respond efficiently to <b>unexpected situations</b> following standard procedures. |

|   |  |
|---|--|
| <p>3. Perform unloading of machines</p> | <p>3.1 Position the truck for unloading following the standard procedures.</p> <p>3.2 Prepare the machine for unloading as per the job requirements following standard procedures.</p> <p>3.3 Unload the machine following standard procedures</p> |
|---|--|

**RANGE STATEMENT**

- Positioned securely may include but not limited to:**
- Level ground.
  - Apply hand brake
  - Engage gear
  - Block the wheels

- Unexpected situations may include but not limited to:**
- Overhead wires and cables
  - Narrow road
  - Gate
  - Bridge carrying capacity

- Critical aspects:**
- Follow occupational health and safety procedures.
  - Perform loading and unloading of machines following standard procedures.
  - Secure the machine after loading as per the job requirements following standard procedures.

| UNDERPINNING KNOWLEDGE   | UNDERPINNING SKILLS  |
|--|--|
| <ul style="list-style-type: none"> <li>• Ethics and Integrity</li> <li>• Occupational health and safety practices</li> <li>• Basic first aid</li> <li>• Checklist and standard procedures</li> <li>• Types of knots</li> <li>• Hand signal</li> <li>• Loading and unloading procedures</li> <li>• Loading capacity</li> <li>• Suitable weather for loading and unloading of machines</li> <li>• Safety procedures for loading and unloading</li> </ul> | <ul style="list-style-type: none"> <li>• Team work</li> <li>• Communication</li> <li>• Problem solving</li> <li>• Interpersonal relationship</li> <li>• Creativity</li> <li>• Time Management</li> </ul> |



## **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**

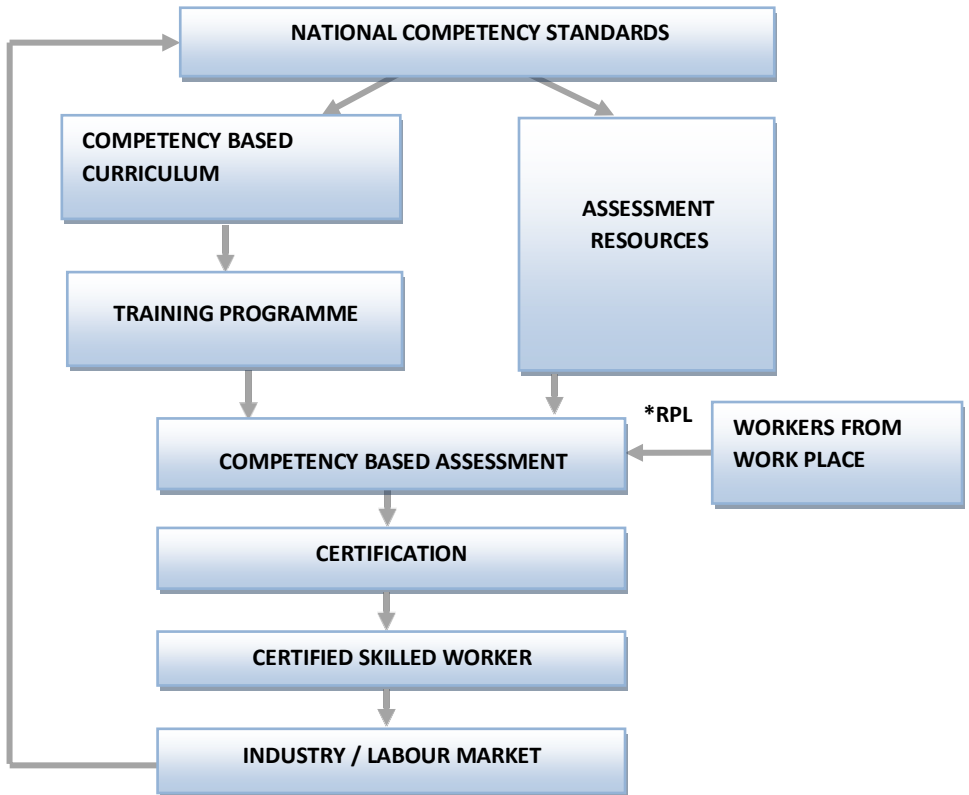
Competency Standards serve a number of purposes including:

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

## National Certificate Level 2 (Craftsman)

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

## National Certificate Level 3 (Master Craftsman)

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

## **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**

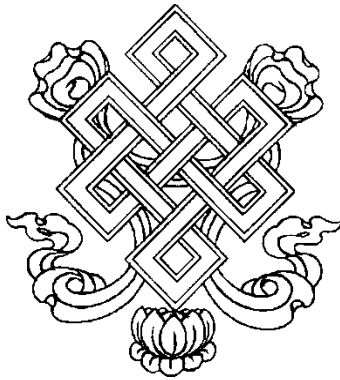
- Continuous assessment together with collected evidence of performance will be used.
- Evidence of the performance shall be based on practical demonstration.
- Knowledge can be assessed through diagrams, in writing or orally (viva- voce).

### **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.



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