NATIONAL COMPETENCY STANDARDS
FOR
HYDRO POWER INSTRUMENTATION TECHNICIAN
(NC3)

Department of Occupational Standards
Ministry of Labour and Human Resources
Thimphu, Bhutan.
(December 2017)

NATIONAL COMPETENCY STANDARDS
FOR
HYDRO POWER INSTRUMENTATION TECHNICIAN
(NC3)

Department of Occupational Standards
Ministry of Labour and Human Resources
Thimphu, Bhutan.
(December 2017)

First publication 2017

Table of Contents

FOREWORD

The Department of Occupational Standards of the Ministry of Labour and Human Resources proudly presents the revised National Competency Standards (NCS) for hydro power Instrumentation technician 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 validated by the validation committees for the concerned economic sectors.

A vocational education and training system based on National Competency Standards shall ensure that delivered 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 implementing the National Competency Standards. The ultimate objective is to build a competent and productive national workforce that will contribute to the continued socio-economic progress of our country.

I gratefully acknowledge the valuable contributions made by experts from industries during the consultation, verification 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.

Dorji Tshering

Director
Department of Occupational Standards,
Ministry of Labour and Human Resources

ACKNOWLEDGEMENT

Validation date : 29th December, 2017.

Endorsement date : 4th January, 2018.

Date of Review : 4th January, 2021 (max. 3 years).

Validation committee members involved in the validation of NCS:

1. Tshewang Dorji (**Chairperson**), Dy. EE, Tala Hydro Power Plant, Sincheykha
2. Jigme Dorji, AE, Chukha Hydro Power Plant, Chukha
3. Rajesh Subbha, Dy. EE, Chukha Hydro Power Plant, Chukha
4. Ugyen Penjor, AEE, Tala Hydro Power Plant, Sincheykha
5. Phub Gyeltshen, AE, Chukha Hydro Power Plant, Chukha
6. Karma Loday (**Member Secretary**), Chief Programme Officer, Standards and Qualification Division, Department of Occupational Standards, MoLHR, Thimphu.

Subject experts involved during the consultation workshop:

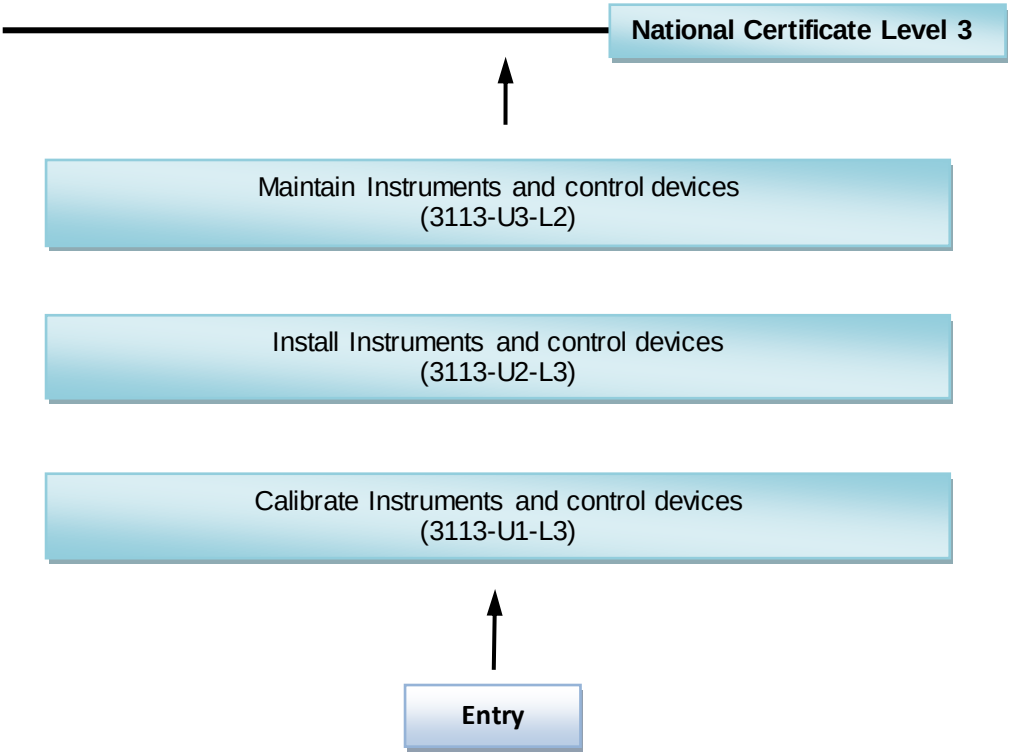
1. Mr. Rinchen Tshering, CHP, DGPC, Chukha
2. Mr. Tenzin Wangchuk, CHP, DGPC, Chukha
3. Mr. Ngawang Gyeltshen, CHP, DGPC, Chukha
4. Mr. Jigme Dorji, CHP, DGPC, Chukha
5. Mr. Jigme Cheku, THP, DGPC, Sincheykha
6. Mr. Ugyen Tshering, THP, DGPC, Sincheykha
7. Mr. Deepak Subbha, THP, DGPC, Sincheykha
8. Mr. Karma Tshering, THP, DGPC, Sincheykha

Development group (Facilitator):

Karma Loday, Chief Program Officer, Department of Occupational Standards (DOS), MoLHR, Thimphu

Tshewang, Deputy Chief Program Officer, Department of Occupational Standards (DOS), MoLHR, Thimphu.

PACKAGING OF QUALIFICATIONS



OVERVIEW OF UNIT COMPETENCIES

National Certificate Level - 3

UNIT TITLE	ELEMENTS OF COMPETENCE
Calibrate Instruments and control devices	1. Diagnose the faults 2. Calibrate instruments 3. Calibrate control devices
Install Instruments and control devices	1. Install instruments 2. Install control devices
Maintain instruments and control devices	1. Maintain instruments 2. Maintain control devices

UNIT TITLE : Calibrate instruments and control devices

DESCRIPTOR : This unit covers the competencies required to diagnose the faults, calibrate instruments and control devices following standard procedures ensuring safety practices at all times.

CODE : 3113-U1-L3

ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Diagnose the faults	1.1 Select and use required ***Personal Protective Equipment (PPE)*** as per the Job requirement following standard procedures 1.2 Select and use required ***tools and equipment*** as per the job requirement following standard procedures. 1.3 Test instruments to identify ***faults*** using testing devices as per the manufacturer's specification following standard procedures
2. Calibrate instruments	2.1 Calibrate ***measuring devices*** as per the job requirement following standard procedures 2.2 Test the measuring devices as per the manufacturer's specification following standard procedures 2.3 Maintain records as per the job requirement following standard procedures
3. Calibrate control devices	3.1 Calibrate ***control devices*** as per the manufacturer's specification following standard procedures 3.2 Test the control devices as per the manufacturer's specification following standard procedures

RANGE STATEMENT
PPE may include but not limited to: • Helmet, • Safety shoe • Working dress • Hand Glove • Goggles
Tools and Equipment may include but not limited to: • Screw driver set • Plier • Spanner set • Soldering iron • Multi meter • Hammer • Wrench set • Allen key set • IR tester
Faults may include but not limited to: • Inaccurate readings • Wear and tear
Measuring devices may include but not limited to: • Meters • Gauges • Regulators
Control devices may include but not limited to: • Sensors • Transducers • Switches • Control valves • Actuators

Critical aspect applicable to these unit:

- Demonstrate safe working practices at all times in accordance with OHS regulations.
- Identify faults as per the job requirement following standard procedures
- Calibrate measuring and control devices as per manufacturer's specification following standard procedures

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • Interpretation of drawings and specifications • Measurement units and instruments • Occupational Health and safety regulations (OHS) • Company rules • First Aids • Working principle of measuring devices • Working principle of control devices • Technical signs and symbols, signals • Instrumentation and control standards • Basic IT	• Communication skills • Work planning skills • Team work • Problem Solving

UNIT TITLE : Install instruments and control devices

DESCRIPTOR : This unit covers the competencies required to install instruments and control devices following standard procedures ensuring safety practices at all times.

CODE : 3113-U2-L3

ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Install instruments	1.1 Select and use required ***Personal Protective Equipment (PPE)*** as per the Job requirement 1.2 Select and use required ***tools and equipment*** as per the job requirement. 1.3 Select required ***materials*** as per the job requirement. 1.4 Test instruments as per the manufacturer's specification following standard procedures 1.5 Install instruments as per the manufacturer's specification following standard procedures 1.6 Conduct functionality test as per the job requirement following standard procedures 1.7 Maintain records as per the job requirement following standard procedures
2. Install control devices	2.1 Test control devices as per the manufacturer's specification following standard procedures 2.2 Install control devices as per the manufacturer's specification following standard procedures 2.3 Conduct functionality test as per the job requirement following standard procedures

RANGE STATEMENT
Tools and Equipment may include but not limited to: • Hole punch • Hammer • Screw driver set • Wrench set • IR tester • Spanner set • Plier • Lifting equipment • Multi meter • Soldering iron
PPE may include but not limited to: • Helmet • Safety shoe • Working dress • Hand gloves • Goggles
Materials may include but not limited to: • Lock tight • Grease • Gasket • Sealing materials • Nut and bolts • Wires • Clamps • Pipes / tubes

Critical aspect

- Demonstrate safe working practices at all times in accordance with OHS regulations.
- Install instruments and control devices as per manufacturer's specification following standard procedures

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • Measurement units • Occupational Health and safety regulations (OHS) • Manufacturer's specification • Company rules	• Interpretation of drawings and specifications • Communication skills • Work planning skills • Team work • Problem solving

• First Aids • Technical signs and symbols • Types of control devices • Types of instruments • Working principle of instruments and control devices • Basic IT	

UNIT TITLE : Maintain instruments and control devices

DESCRIPTOR : This unit covers the competencies required to maintain instruments and control devices following standard procedures ensuring safety at all times.

CODE : 3113-U3-L3

ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Maintain instruments	1.1 Select and use required ***Personal Protective Equipment (PPE)*** as per the Job requirement following standard procedures
	1.2 Select and use required ***tools and equipment*** as per the job requirement following standard procedures.
	1.3 Diagnose ***faults*** using testing devices as per the manufacturer's specification following standard procedures
	1.4 Repair faulty instruments / components as per the job requirement following standard procedures
	1.5 Maintain records as per the job requirement following standard procedures
2. Maintain control devices	2.1 Diagnose faults using testing devices as per the manufacturer's specification following standard procedures
	2.2 Repair faulty control devices / components as per the job requirement following standard procedures

RANGE STATEMENT
PPE may include but not limited to: • Helmet • Safety shoe • Working dress • Hand gloves • Goggles
Tools and Equipment may include but not limited to: • Hole punch • Hammer • Screw driver set • Wrench set • IR tester • Spanner set • Plier • Lifting equipment • Multi meter • Soldering iron
Faults may include but not limited to: • Wear and tear • Breakages • Leakages • Electrical faults • Mechanical faults • Electronic faults

Critical aspect

- Demonstrate safe working practices at all times in accordance with OHS regulations.
- Repair faulty instruments / control devices / components as per the manufacturer's specification following standard procedures

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • Measurement units • Occupational Health and safety regulations (OHS) • Manufacturer's specification • Working principle of instruments and control devices • Company rules • First Aids • Technical signs and symbols • Basic IT	• Interpretation of drawings and specification • Communication skills • Work planning skills • Team work • Working at height • Problem solving

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

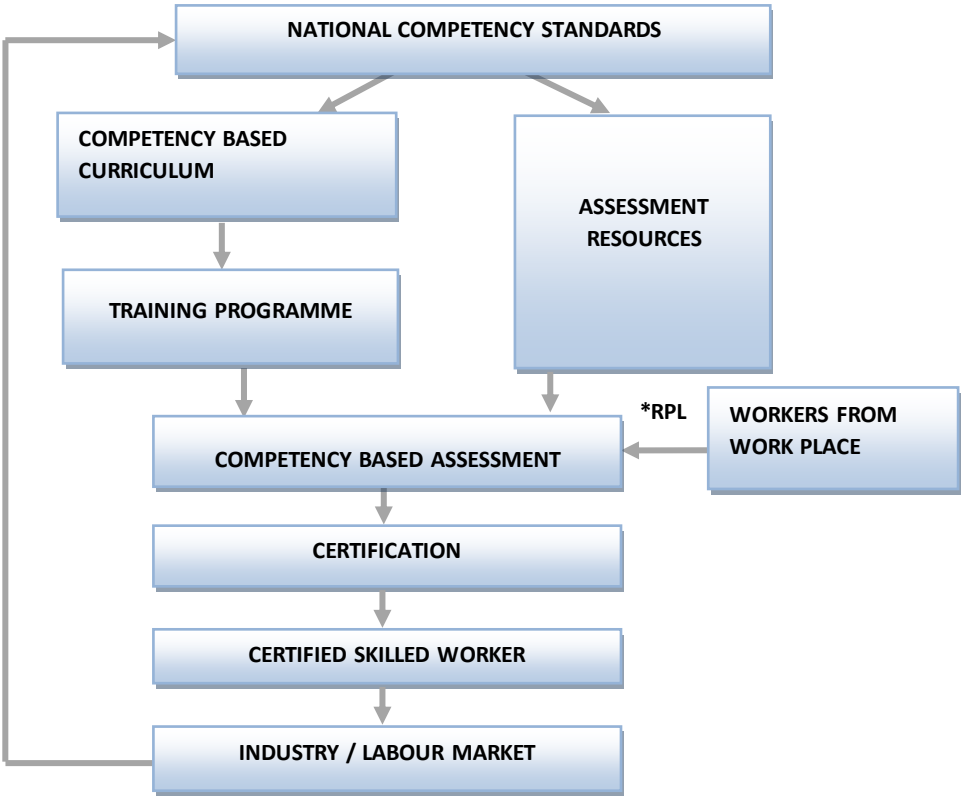
Competency Standards serve a number of purposes including:

- 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**

1.3 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:
• Are narrow in range. • Are established and familiar. • Offer a clear choice of routine responses. • Involve some prioritizing of tasks from known solutions.	• Basic operational knowledge and skill. • Utilization of basic available information. • Known solutions to familiar problems. • Little generation of new ideas.	• 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:
• Require a range of well-developed skills. • Offer a significant choice of procedures requiring prioritization. • Are employed within a range of familiar context.	• Some relevant theoretical knowledge. • Interpretation of available information. • Discretion and judgment. • A range of known responses to familiar problems	• 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:
• 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.	• 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.	• 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 practises. 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 packages.

1.6 ASSESSMENT GUIDE

Form of assessments

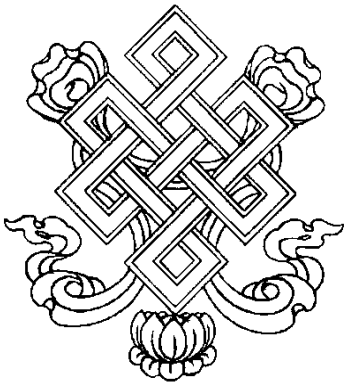
- Continuous assessment together with collected evidence of performance will be used.
- Evidence of the performance shall be based on practical demonstration.
- Knowledge can be assessed through diagrams, in writing or orally (viva-voce).

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