



# **NATIONAL COMPETENCY STANDARDS FOR ELECTRICIAN (HYDRO POWER PLANT)**

**Department of Occupational Standards  
Ministry of Labour and Human Resources  
Thimphu, Bhutan.**





**NATIONAL COMPETENCY STANDARDS  
FOR  
ELECTRICIAN (HYDRO POWER PLANT)**

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## FOREWORD

The Department of Occupational Standards of the Ministry of Labour and Human Resources proudly presents National Competency Standards (NCSs) for Electrician (Hydro Power Plant) 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 Competency 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 Technical Advisory 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.

Director  
Department of Occupational Standards  
Ministry of Labour and Human Resources

## **INTRODUCTION**

### **A. 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.

#### **Purpose of National Competency Standards**

Competency Standards serve a number of purposes including:

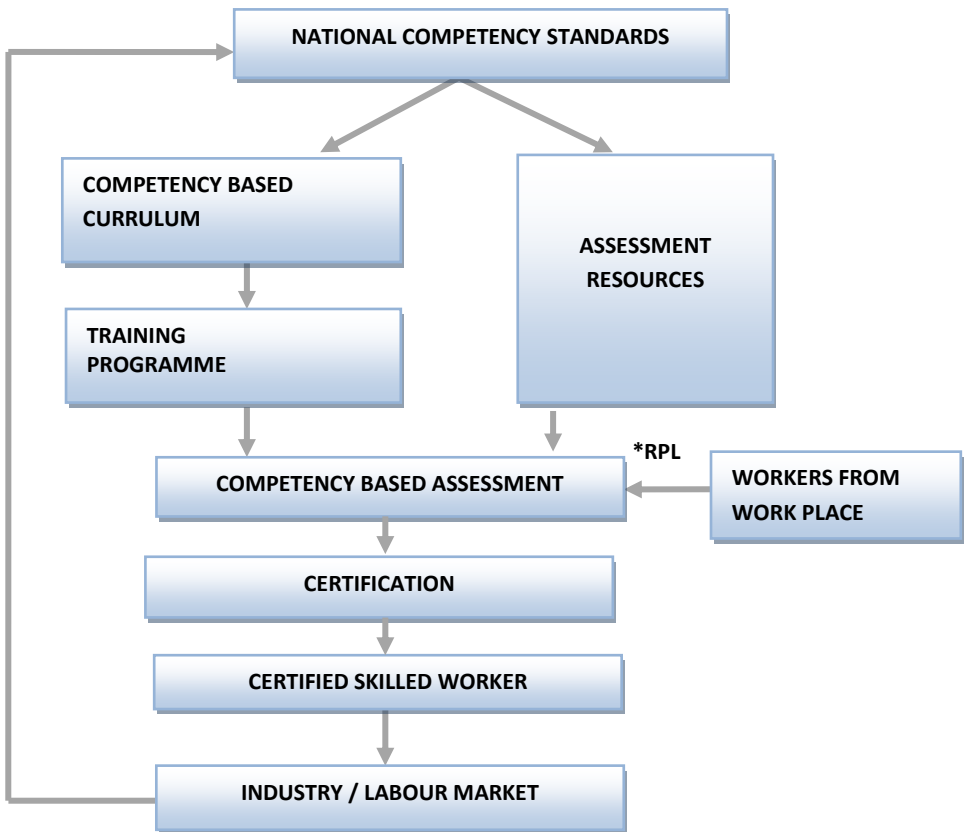
- Providing advice to curriculum developers about the skill and knowledge to be included in curriculum.
- Providing specifications to assessment resource developers about the skill, knowledge and attitudes within an occupation to be demonstrated by candidates.
- Providing advice to industry/employers about job functions, which in turn can be used for the development of job descriptions, performance appraisal systems and work flow analysis.



## B. Bhutan Vocational Qualification Framework (BVQF)

Bhutan Vocational Qualifications Framework is an agreed system of Assessing, Certifying and Monitoring nationally recognized qualifications for all learning in the TVET 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

## BVQF Levels

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

- National Certificate Level 3 (NC III)
- National Certificate Level 2 (NC II)
- National Certificate Level 1 (NC I)

## 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

<b>Carry out processes that:</b>	<b>Learning demand:</b>	<b>Responsibilities which are applied:</b>
<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

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 judgments.</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

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>

## **PURPOSE**

This suite of three qualifications is designed for people interested in a career as Electrician (Hydro Power Plant).

The first of the qualifications is the National Certificate in Electrician (Hydro Power Plant) level 2. The qualification comprises six unit titles that cover the essential knowledge and skills required for Electrician (Hydro Power Plant).

The Level 2 qualification recognizes the skills and knowledge required for people working as a skilled Electrician (hydro power plant) and builds on the skills and knowledge that candidates will have gained through the successful completion of the Level 1 certificate, if any. This qualification prepares people for entry into the National Certificate Level 3.

The National Certificate in Electrician (Hydro Power Plant) Level 3 is currently the final achievement in this qualification pathway. Candidates wishing to be admitted into training will already hold the National Certificate in Electrician (Hydro Power Plant) Level 2. The Level 3 qualification recognizes the competencies required to work as a highly skilled Electrician (Hydro Power Plant).

A diagram of the qualification pathway provided by these three National Certificates follows.

## PACKAGING OF QUALIFICATIONS FOR ELECTRICIAN (HYDRO POWER PLANT)

**National Certificate Level 3**

Maintain EOT crane (3113-U11-L3)

Maintain Protection System (3113-U10-L3)

Maintain Breakers (3113-U9-L3)

Maintain Excitation System (3113-U8-L3)

Maintain Generator (3113-U7-L3)

Maintain Transformer (3113-U6-L3)

**National Certificate Level 2**

Maintain Switch Yard (3113-U5-L2)

Maintain Auxiliary System (3113-U4-L2)

Maintain Lighting & communication system (3113-U3-L2)

Maintain Back-up system (3113-U2-L2)

Maintain Ventilation System (3113-U1-L2)

**ENTRY**

## **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 National Competency Standards**

Coding the individual Competency Standard has a multiple purpose:

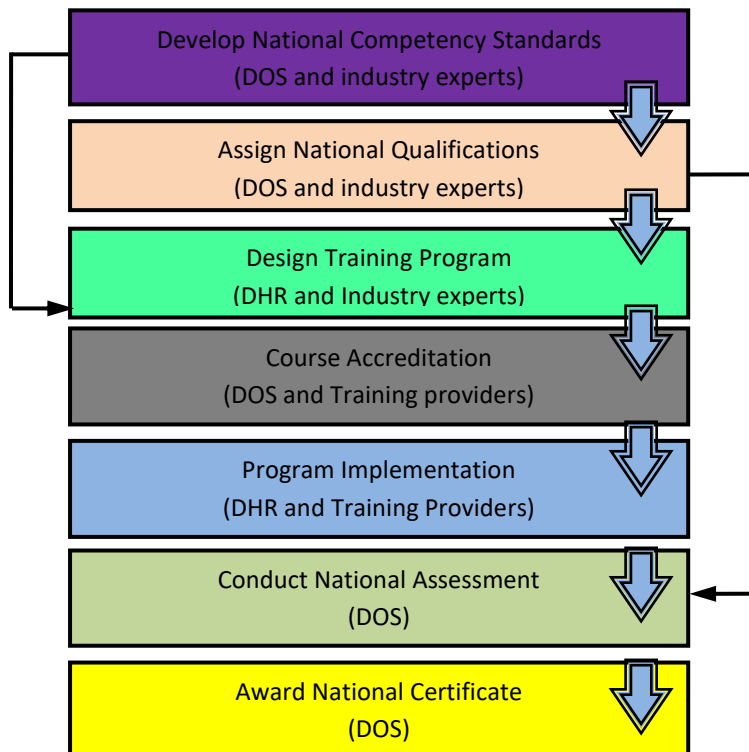
- to identify the level,
- to identify to which module the standard belongs,
- to identify in which order the standard is clustered within that module.

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.

To illustrate with an example the ILO assigns the code 3113 to the occupation Electrical engineering technicians and related workers. Therefore, in the Bhutan context, the occupation Electrician (hydro power plant) has been assigned the code 3113 in the National Coding System. The first Unit is assigned the code Unit1, the first National Competency Standard clustered into the first Unit (U1) is designated the code 3113 U1. Levels are assigned the code L and follow a logical progression from the National Certificate Level 1 (NC I) to the National Certificate Level 3 (NC III). Therefore the National Certificate Level 3 is assigned the code L3.

## Implementation and operational procedures for National Competency Standard (NCS)



### Key:

MoLHR – Ministry of Labour and Human Resources

DHR – Department of Human Resources

DOS – Department of Occupational Standards

## **NATIONAL COMPETENCY STANDARDS FOR ELECTRICIAN (HYRDO POWER PLANT)**

**Validation date** : 08/05/2014

**Endorsement date** : 12/05/2014

**Date of Review** : 08/05/2017

### **Technical Advisory Committee (TAC) members for Power Sector involved in the validation of NCS:**

National Competency Standard was validated by the Operation and Maintenance Division/unit heads.

### **Subject experts involved during the consultative workshop of Electrician (Hydro Power Plant):**

1. Dorji Wangchuk, Electrician, Tala Hydro power plant
2. Sonam Dendup, Electrician, Tala Hydro power plant
3. Karma Tshering, Electrician, Tala Hydro power plant
4. Sonam Yangzom, Electrician, Tala Hydro power plant
5. Kinley Sithub, Electrician, Tala Hydro power plant
6. Kelzang Dawa, Electrician, Tala Hydro power plant
7. Tempel, Electrician, Tala Hydro power plant
8. Tshering Dendup, Electrician, Tala Hydro power plant
9. Sherub Tharchen, Electrician, Tala Hydro power plant
10. Phurpa Dorji, Electrician, Tala Hydro power plant
11. Dawa Tenzin, Electrician, Tala Hydro power plant
12. Man Bdr. Mongar, Electrician, Tala Hydro power plant
13. Yeshe Dorji, Electrician, Tala Hydro power plant



14. Kinley Wangmo, Electrician, Tala Hydro power plant
15. Sunita Sharma, Electrician, Tala Hydro power plant
16. Phajo Tshering, , Electrician, Tala Hydro power plant
17. Tshering Dorji, Electrician, Tala Hydro power plant
18. Ugyen Tshering, Electrician, Tala Hydro power plant

**Development group (Facilitator):**

Tshewang, Sr. Program Officer, SQD, Department of Occupational Standards (DOS), MoLHR, Thimphu.

Chogay Lhendup, Asst. Program Officer, SQD, Department of Occupational Standards (DOS), MoLHR, Thimphu.

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**UNIT TITLE :** Maintain Ventilation system

**DESCRIPTOR:** This unit covers the competencies required to maintain ventilation and cooling system ensuring health and safety at workplaces.

**CODE :** 3113-U1-L2

ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Prepare for work	<p>1.1 Select and use Personal Protective Equipments (PPE) as per the job requirement</p> <p>1.2 Select and use <b>tools and equipments</b> as per the job requirement</p> <p>1.3 Select and use <b>materials</b> as per the job requirement.</p>
2. Maintain Ventilation systems	<p>2.1 Disconnect the system as per the job requirement</p> <p>2.2 Check the conditions of motors and service faulty components as per the job requirement</p> <p>2.3 Check and measure IR value as per the job requirement</p> <p>2.4 Check the conditions of belts and service/ adjust as per the job requirement</p> <p>2.5 Check the duct conditions/ air leakages and service as per the job requirement</p> <p>2.6 Check the conditions of bearing and take necessary action as per the job requirement</p> <p>2.7 Check the conditions/ tightness of pulley and take necessary actions as per the job requirement</p> <p>2.8 Check the conditions of filters and blowers and take necessary actions as per the job</p>

	<p>requirement</p> <p>2.9 Check the control circuit and power circuit and take necessary actions as per the job requirement</p> <p>2.10 Align ventilation components as per standard practices</p> <p>2.11 Test ventilation system to ensure proper functioning as per the job requirement</p> <p>2.12 Check the conditions of nuts and bolts and tightened as per the job requirement</p>
3. Complete the work	<p>3.1 Maintain reports as per the standard operating procedures</p> <p>3.2 Conduct test to ensure proper functioning as per the standard operating procedures</p> <p>3.3 Ensure clean working environment as per the Standard Operating Procedures.</p>

### RANGE STATEMENT

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

- Bearing puller
- Grease Gun
- Allen key set
- Hammer

#### Materials may include but not limited to:

- Grease
- Cloth
- Bearing
- Insulation tape
- V-belt

### 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, equipments, materials and documents.
- Candidate must complete the assessment in industry accepted time frame.

#### **Critical aspect**

- Check the conditions of motors and service faulty components as per the job requirement
- Align ventilation components as per standard practices

<b>UNDERPINNING KNOWLEDGE</b>	<b>UNDERPINNING SKILLS</b>
<ul style="list-style-type: none"><li>• Drawings and specifications</li><li>• Working principles of Ventilation system</li><li>• First Aid</li><li>• Occupational Health and Safety Regulation</li><li>• Operating principles of motors</li></ul>	<ul style="list-style-type: none"><li>• Use of tools and equipments</li><li>• Planning</li><li>• Team work</li><li>• Communication skills</li><li>• Problem solving</li><li>• Coordination</li></ul>

**UNIT TITLE :** Maintain Back- up system

**DESCRIPTOR:** This unit covers the competencies required to maintain battery bank and diesel generator set effectively following standard practices.

**CODE :** 3113-U2-L2

<b>ELEMENTS OF COMPETENCE</b>	<b>PERFORMANCE CRITERIA</b>
1. Prepare for work	1.1 Select and use required Personal Protective Equipment (PPE) as per the job requirement 1.2 Select and use <b>tools and equipments</b> as per the job requirement 1.3 Select and use <b>materials</b> as per the job requirement
2. Maintain Battery bank	2.1 Measure output voltage and specific gravity of battery as per the standard operating procedures 2.2 Check the level of electrolyte and take necessary actions as per the job requirement 2.3 Check battery terminals and service as per the job requirement 2.4 Check the conditions of battery charger and service as per the job requirement
3. Maintain Diesel Generator(DG) set	3.1 Check the conditions /levels of oils and replace oils/ filters if necessary as per the job requirement 3.2 Check the conditions/ level of coolant and replace if necessary as per the job requirement 3.3 Check and ensure water circulation flow and take necessary actions as per the job requirement 3.4 Check the conditions and functioning of control

	<p>circuits and take necessary actions as per the job requirement</p> <p>3.5 Check the conditions of NGT(neutral ground terminal) operation and take necessary actions as per the job requirement</p>
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## RANGE STATEMENT

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

- Hydro meter
- Screw driver set
- Cell tester
- Plier set
- Multi-meter wrench set

### **Materials may include but not limited to:**

- Distilled water
- Diesel
- Acid cloth
- Engine oil
- Petroleum jelly
- Filters
- Insulation tape
- Coolant

## 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, equipments,



materials and documents.

- Candidate must complete the assessment in industry accepted time frame.

**Critical aspect**

- Measure output voltage and specific gravity of battery as per the standard operating procedures
- Check the level of electrolyte and take necessary actions as per the job requirement
- Check the conditions /levels of oils and replace oils/ filters if necessary as per the job requirement
- Check the conditions of battery charger and service as per the job requirement

<b>UNDERPINNING KNOWLEDGE</b>	<b>UNDERPINNING SKILLS</b>
<ul style="list-style-type: none"><li>• Drawings and specifications</li><li>• First Aids</li><li>• Occupational Health and safety regulations</li><li>• Working principles of DG</li><li>• Operating procedures</li><li>• Types of lubricants</li><li>• Types of filters</li></ul>	<ul style="list-style-type: none"><li>• Use of tools and equipments</li><li>• Planning</li><li>• Team work</li><li>• Coordination</li><li>• Communication skills</li><li>• Problem solving skills</li></ul>

**UNIT TITLE : Maintain Lighting and communication system**

**DESCRIPTOR :** This unit covers the competencies required to install and maintain lighting and communication system following standard practices.

**CODE : 3113-U3-L2**

<b>ELEMENTS OF COMPETENCE</b>	<b>PERFORMANCE CRITERIA</b>
1. Prepare for work	1.1 Select and use required <b>Personal Protective Equipments (PPE)</b> as per the Job requirement 1.2 Select and use required <b>tools and equipments</b> as per the job requirement. 1.3 Select required <b>materials</b> as per the job requirement.
2. Install Lighting and communication system	2.1 Lay out PVC conduit or casing capping as per the drawing and specification 2.2 Draw wire as per the circuit requirement in accordance with drawings and specifications 2.3 Fix fittings and fixtures firmly as per the drawings and specifications 2.4 Install distribution box and circuit breakers as per the drawing and specifications 2.5 Install earthing as per the standard practices 2.6 Conduct <b>test</b> as per the job requirement. 2.7 Rectify the <b>faults and defects</b> and take necessary actions as per the standard practices.
3. Complete the work	3.1 Commission the works to the concerned personnel as per the job requirement 3.2 Prepare reports as per the job requirement 3.3 Ensure clean working environment as per the

**RANGE STATEMENT**

**PPE may include but not limited to:**

- Helmet
- Safety shoes
- Safety belt
- Mask

**Tools and Equipments may include but not limited to:**

- Pliers
- Crimping tools
- Screw driver set
- Hack saw
- Tester
- Spirit level
- Multi meter
- Measuring tape
- Wire stripper
- Crown tool
- Hammer

**Materials may include but not limited to:**

- Insulation tape
- Fitting and fixtures
- Wire
- Lugs

**Test may include but not limited to:**

- Insulation
- Continuity test
- Short circuit test
- Earth resistant test

**Faults and defects may include but not limited to:**

- Breakages
- Short circuit

## 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, equipments, materials and documents.
- Candidate must complete the assessment in industry accepted time frame.

### **Critical aspect**

- Fixing of fittings and fixtures firmly as per the drawings and specifications
- Conduct test to ensure proper functioning of lighting and communication systems.

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> <li>• Interpretation of drawings</li> <li>• Basic costing and estimations</li> <li>• Occupational Health and safety regulations (OHS)</li> <li>• Company rules</li> <li>• First Aids</li> <li>• Fittings and fixtures</li> <li>• Types of earthing, cables, circuit breakers</li> <li>• Basic electrical laws</li> </ul>	<ul style="list-style-type: none"> <li>• Usage of tools and equipments</li> <li>• Communication skills</li> <li>• Work planning skills</li> <li>• Team work</li> <li>• Coordination</li> <li>• Problem solving</li> </ul>

**UNIT TITLE :** Maintain Auxiliary system

**DESCRIPTOR:** This unit covers the competencies required to maintain and service auxiliary system and electrical motors effectively following safety measures.

**CODE :** 3113-U4-L2

<b>ELEMENTS OF COMPETENCE</b>	<b>PERFORMANCE CRITERIA</b>
1. Prepare for work	1.1 Select and use required <b>tools and equipment</b> as per the job requirement 1.2 Select and use personal protective equipments (PPE) as per the job requirement. 1.3 Select required <b>materials</b> as per the job requirement
2. Service Auxiliary system (electrical motors)	1.1 Disconnect the motors and take necessary actions as per the job requirement 1.2 Check motor terminals and service as per the job requirement 1.3 Check and measure IR( Insulation Resistance) of motor winding as per the standard practices 1.4 Check and lubricate the bearings as per the job requirement 1.5 Check control circuits and power circuit and service as per the job requirement 1.6 Check the fuse and replace it as per the job requirement 1.7 Test run motors for proper functioning as per the standard practices
3. Complete the work	3.1 Maintain reports as per the standard operating procedures 3.2 Conduct test to ensure proper functioning as per the standard operating procedures

	3.3 Ensure clean working environment as per the Standard Operating Procedures.
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### RANGE STATEMENT

**Materials may include but not limited to:**

- Fuse
- Grease
- CRC
- Rustoline

**Tools and equipments may include but not limited to:**

- Micro meter
- Screw drivers
- D-wrench

### 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, equipments, materials and documents.
- Candidate must complete the assessment in industry accepted time frame.

**Critical aspect**

- Aware of abnormal functioning of motors
- Check and measure insulation resistance of motor winding
- Check the conditions of control circuit and power circuit and service as per the job requirement

<b>UNDERPINNING KNOWLEDGE</b>	<b>UNDERPINNING SKILLS</b>
<ul style="list-style-type: none"><li>• Drawings and specifications</li><li>• Circuit diagrams</li><li>• Occupational Health and safety regulations (OHS)</li><li>• Company rules</li><li>• First Aids</li><li>• Working principles of Motors</li><li>• Types and functions of motors</li><li>• Control panels</li><li>• Basic knowledge of industrial wirings(contactors)</li></ul>	<ul style="list-style-type: none"><li>• Usage of tools and equipments</li><li>• Communication skills</li><li>• Work planning skills</li><li>• Team work</li><li>• Problem solving</li></ul>



**UNIT TITLE :** Maintain Switch Yard

**DESCRIPTOR:** This unit covers the competencies required to maintain switch yard, Conductors, Capacitive, voltage transformer, insulator and switches following safety at workplaces.

**CODE :** 3113-U5-L2

<b>ELEMENTS OF COMPETENCE</b>	<b>PERFORMANCE CRITERIA</b>
1. Prepare for work	1.1 Select and use required <b>Personal Protective Equipments (PPE)</b> as per the Job requirement 1.2 Select and use required <b>tools and equipments</b> as per the job requirement. 1.3 Select required <b>materials</b> as per the job requirement.
2. Service Conductors, Capacitive voltage transformer, insulator and switches	2.1 Check the conditions of conductor and replace if necessary as per job requirement 2.2 Check the conditions of parallel grove and replace if necessary as per job requirement 2.3 Check nuts and bolts and tightened as per job requirement 2.4 Check the conditions/level of oil and take necessary actions as per the standard practices 2.5 Check the winding terminals and service as per the job requirement 2.6 Check the insulator and service as per the job requirement 2.7 Check wave trap and service as per the job requirement 2.8 Check isolator contact and service if necessary as per the job requirement

	<p>2.9 Check isolator operating motor and service as per the job requirement</p> <p>2.10 Check rotating parts and service as per the job requirement</p> <p>2.11 Check limit switch and adjust if necessary as per the job requirement</p> <p>2.12 Check earth switch and service as per the job requirement.</p> <p>2.13 Check contact assembly and service as per the job requirement</p> <p>2.14 Check flexible link and replace if necessary as per the job requirement</p> <p>2.15 Inspect power cables and service if necessary as per the job requirement</p> <p>2.16 Check earthing system of power cables and tightened as per the job requirement</p> <p>2.17 Check lightening arrester as per the standard procedures.</p>
<p>3. Complete the work</p>	<p>3.1 Maintain reports as per the standard operating procedures</p> <p>3.2 Conduct test to ensure proper functioning as per the standard operating procedures</p> <p>3.3 Ensure clean working environment as per the Standard Operating Procedures.</p>

### RANGE STATEMENT

**PPE may include but not limited to:**

- Safety belt
- High voltage gloves
- Mask
- Helmet
- Goggles

**Materials may include but not limited to:**

- Grease
- Petroleum gel

- CRC
- Conductor

## 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, equipments, materials and documents.
- Candidate must complete the assessment in industry accepted time frame.

### **Critical aspect**

- Check isolator contact and service if necessary as per the job requirement
- Check earth switch and service as per the job requirement.

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> <li>• Drawings and specifications</li> <li>• Circuit diagrams</li> <li>• Occupational Health and safety regulations (OHS)</li> <li>• Company rules</li> <li>• First Aids</li> <li>• Working principles of switch yard</li> </ul>	<ul style="list-style-type: none"> <li>• Usage of tools and equipments</li> <li>• Communication skills</li> <li>• Work planning skills</li> <li>• Team work</li> <li>• Problem solving</li> <li>• Coordination</li> </ul>

**UNIT TITLE :** Maintain Transformer

**DESCRIPTOR:** This unit covers the competencies required to maintain transformer effectively following standard practices.

**CODE :** 3113-U6-L3

ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Prepare for work	<p>1.1 Select and use required <b>Personal Protective Equipments (PPE)</b> as per the Job requirement</p> <p>1.2 Select and use required <b>tools and equipments</b> as per the job requirement.</p> <p>1.3 Select required <b>materials</b> as per the job requirement.</p>
2. Maintain Transformer	<p>2.1 Isolate transformer as per the standard operating procedures</p> <p>2.2 Check for proper neutral grounding as per the standard procedures.</p> <p>2.3 Discharge transformer as per the standard procedures</p> <p>2.4 Check the conditions of bushings and replace if necessary as per the standard procedures</p> <p>2.5 Check the condition/ level of transformer oil and take necessary actions as per job requirement</p> <p>2.6 Check for leakages and take necessary actions as per job requirement</p> <p>2.7 Check the colour of silica gel and re-treat as per the standard procedures</p> <p>2.8 Check arcing horn gap and maintain it as per the specifications</p> <p>2.9 Test <b>protective device</b> to ensure proper functioning as per the standard procedures</p>

	<p>2.10 Check cooling system flow and take necessary actions as per job requirement</p> <p>2.11 Check winding temperature and take necessary action as per the job requirement</p> <p>2.12 Check the conditions/position of tape changer and take necessary actions as per the job requirement</p> <p>2.13 Measure insulation resistance of transformer winding as per standard procedures</p> <p>2.14 Check the conditions of nuts and bolts and tightened where necessary as per the job requirement</p>
3. Complete the work	<p>6.1 Maintain reports as per the standard operating procedures</p> <p>6.2 Conduct test to ensure proper functioning as per the standard operating procedures</p> <p>3.1 Ensure clean working environment as per the Standard Operating Procedures.</p>

### RANGE STATEMENT

#### PPE may include but not limited to:

- Helmet
- Safety boot
- Safety belts
- Mask

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

- Wrench set
- Spanner
- Plier,
- Screw driver set
- Tester
- Multi meter
- Meggar

#### Materials may include but not limited to:

- Insulation tape
- Oil
- Cloth
- Petroleum jelly
- Silica jell

**Protective device may include but not limited to:**

- Relays
- Pressure relieve valves

**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, equipments, materials and documents.
- Candidate must complete the assessment in industry accepted time frame.

**Critical aspect**

- Measure insulation resistance of transformer winding as per standard procedures
- Check the condition/ level of transformer oil and take necessary actions as per job requirement

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> <li>• Interpretation of drawings and specifications</li> <li>• Measurement units</li> <li>• Occupational Health and safety regulations (OHS)</li> <li>• Company rules</li> <li>• First Aids</li> <li>• Types of transformer</li> <li>• Basic operating principles of transformer</li> </ul>	<ul style="list-style-type: none"> <li>• Usage of tools and equipments</li> <li>• Communication skills</li> <li>• Work planning skills</li> <li>• Team work</li> <li>• Problem Solving</li> <li>• Positive work values</li> </ul>



**UNIT TITLE :** Maintain Generator

**DESCRIPTOR:** This unit covers the competencies required to maintain generator effectively following health and safety at workplaces

**CODE :** 3113-U7-L3

<b>ELEMENTS OF COMPETENCE</b>	<b>PERFORMANCE CRITERIA</b>
1. Prepare for work	1.1 Select and use personal protective equipments(PPE) as per the job requirement 1.2 Select and use <b>tools and equipments</b> as per the job requirement 1.3 Select and use <b>materials</b> as per the job requirement
2. Maintain Generator	2.1 Isolate generator from the system as per the standard practices 2.2 Check the condition of slip ring and replace if necessary as per the job requirement 2.3 Check the condition of carbon brush and brush holder/rocker and replace if necessary as per the job requirement 2.4 Adjust gap between brush holder and slip ring to the specified value as per the specification 2.5 Check the conditions/functioning of <b>sensors</b> and replace if necessary, as per the Standard operating procedures 2.6 Adjust the gap between sensors and rotating shaft to the specified value as per specification 2.7 Check and measure IR value of <b>windings</b> and service if necessary as per the job requirement 2.8 Check and conduct pole drop test on poles and

	<p>service if necessary as per the job requirement</p> <p>2.9 Check and measure IR value of Neutral Grounding Transformer(NGT) and resistance of resistor and service as per the job requirement</p> <p>2.10 Check the condition of air guide and support ring and service as per the job requirement</p> <p>2.11 Check and ensure gap between pole and stator as per the specification</p> <p>2.12 Check nuts and bolts and tightened if necessary as per job requirement</p>
3. Complete the work	<p>3.1 Maintain reports as per the standard operating procedures</p> <p>3.2 Conduct test to ensure proper functioning as per the standard operating procedures</p> <p>3.3 Ensure clean working environment as per the Standard Operating Procedures.</p>

## RANGE STATEMENT

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

- Meggar
- Wrench Set
- Plier
- Multi meter
- Screw driver set
- D-ring
- Spring balance
- Filler gauge
- Vernier caliper

**Materials may include but not limited to:**

- Earthing wire
- Cloth
- Insulation Tape
- CRC
- MTO

**Sensors may include but not limited to:**

- Over speed sensor
- Mechanical hydro sensor
- SSG(speed signal generator)
- RTD resistance temperature detector
- DTT (Dial type thermometer )
- Thermostat

**Windings may include but not limited to:**

- Stator winding
- Rotor winding

**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, equipments, materials and documents.
- Candidate must complete the assessment in industry accepted time frame.

**Critical aspect**

- Isolate generator from the system as per the standard practices
- Check and measure IR value of windings and service if necessary as per the job requirement
- Check the conditions/functioning of sensors and replace if necessary, as per the Standard operating procedures
- Check and conduct pole drop test on poles and service if necessary as per the job requirement

<b>UNDERPINNING KNOWLEDGE</b>	<b>UNDERPINNING SKILLS</b>
<ul style="list-style-type: none"><li>• Occupational Health and Safety regulation</li><li>• First Aids</li><li>• Working principles of generator</li><li>• Drawings and specifications</li><li>• Parts of generators</li><li>• Types of sensors</li><li>• Tools and equipment</li></ul>	<ul style="list-style-type: none"><li>• Use of tools and equipments</li><li>• Team Work</li><li>• Communication skills</li><li>• Planning</li><li>• Coordination</li></ul>

**UNIT TITLE :** Maintain Excitation system

**DESCRIPTOR:** This unit covers the competencies required to maintain and service excitation system following health and safety at workplaces.

**CODE :** 3113-U8-L3

<b>ELEMENTS OF COMPETENCE</b>	<b>PERFORMANCE CRITERIA</b>
1. Prepare for work	1.1 Select and use required <b>tools and equipment</b> as per the job requirement 1.2 Select and use <b>personal protective equipments (PPE)</b> as per the job requirement. 1.3 Select required <b>materials</b> as per the job requirement
2. Service Excitation system	2.1 Disconnect power supply as per the job requirement 2.2 Dismantle and service cooling fan, thyristor cubicle as per the job requirement 2.3 Check and measure IR value as per the job requirement 2.4 Test for proper functioning of cooling fans as per the standard practices 2.5 Check field breaker(tipping coil and closing coil) and replace as per the job requirement 2.6 Check the conditions of nuts and bolts and tightened as per the job requirement. 2.7 Check field flashing terminal and replace if necessary as per the job requirement 2.8 Check IR value for PT & CT (potential transformer, current transformer) and replace it if necessary as per the job requirement. 2.9 Check regulation panel and its components,

	transformer auxiliary relay and service if necessary as per the job requirement
3. Complete the work	<p>3.1 Maintain reports as per the standard operating procedures</p> <p>3.2 Conduct test to ensure proper functioning as per the standard operating procedures</p> <p>3.3 Ensure clean working environment as per the Standard Operating Procedures.</p>

### RANGE STATEMENT

#### Materials may include but not limited to:

- Cloth
- Coolant
- Insulation tape
- Brush

#### PPE may include but not limited to:

- Goggles
- Gloves
- Safety shoe
- Helmet

### 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, equipments, materials and documents.
- Candidate must complete the assessment in industry accepted time frame.

**Critical aspect**

- Check field breaker(tipping coil and closing coil) and replace as per the job requirement
- Dismantle and service cooling fan, thyristor cubicle as per the job requirement

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"><li>• Drawings and specifications</li><li>• Occupational Health and safety regulations (OHS)</li><li>• Company rules</li><li>• First Aids</li><li>• Basic excitation system</li></ul>	<ul style="list-style-type: none"><li>• Usage of tools and equipments</li><li>• Communication skills</li><li>• Work planning skills</li><li>• Team work</li><li>• Coordination</li><li>•</li></ul>

**UNIT TITLE :** **Maintain breakers**

**DESCRIPTOR:** This unit covers the competencies required to maintain and service breakers following health and safety at workplaces.

**CODE :** **3113-U9-L3**

<b>ELEMENTS OF COMPETENCE</b>	<b>PERFORMANCE CRITERIA</b>
1. Prepare for work	1.1 Select and use required Personal Protective Equipments (PPE) as per the Job requirement 1.2 Select and use required tools and equipments as per the job requirement. 1.3 Select required materials as per the job requirement.
2. Service breakers	2.1 Check the level of breaker oil, if necessary and take necessary action as per the job requirements 2.2 Check the condition of <b>contact</b> and contact clamps and service if necessary as per the job requirements 2.3 Check the condition of spring charging motor and replace if necessary as per the job requirements 2.4 Check the condition of tripping / closing coils and replace if necessary as per the job requirements 2.5 Check control circuit and take necessary actions as per the job requirement 2.6 Check and lubricate the moving parts as per the job requirements 2.7 Check the condition of limit switch and replace if necessary as per the job requirements 2.8 Check condition of arc chute and take necessary action as per the job requirements



	2.9	Check the tightness of terminal screw / nuts and bolts and tightened if necessary as per the job requirements.
	2.10	Conduct necessary test as per the job requirements
3. Complete the work	3.1	Maintain reports as per the standard operating procedures
	3.2	Conduct test to ensure proper functioning as per the standard operating procedures
	3.3	Ensure clean working environment as per the Standard Operating Procedures.

### RANGE STATEMENT

**Contact may include but not limited to:**

- Main contact
- Arc contact
- Male & female contact

### 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, equipments, materials and documents.
- Candidate must complete the assessment in industry accepted time frame.

**Critical aspect**

- Ensure the strength and accuracy of main contacts as per the standard practices

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> <li>• Drawings and specifications</li> <li>• Circuit diagrams</li> <li>• Measurement units</li> <li>• Occupational Health and safety regulations (OHS)</li> <li>• Company rules</li> <li>• First Aids</li> <li>• Types of breakers</li> <li>• Basic operating principles of breakers</li> <li>• Parts of breakers</li> </ul>	<ul style="list-style-type: none"> <li>• Usage of tools and equipments</li> <li>• Communication skills</li> <li>• Work planning skills</li> <li>• Team work</li> <li>• Problem solving</li> </ul>

**UNIT TITLE : Maintain Protection system**

**DESCRIPTOR:** This unit covers the competencies required to maintain protection system following health and safety at workplace.

**CODE : 3113-U10-L3**

<b>ELEMENTS OF COMPETENCE</b>	<b>PERFORMANCE CRITERIA</b>
1. Prepare for work	1.1 Select and use required <b>Personal Protective Equipments (PPE)</b> as per the Job requirement 1.2 Select and use required <b>tools and equipments</b> as per the job requirement. 1.3 Select required <b>materials</b> as per the job requirement.
2. Maintain Protection system	2.1 Check the condition of relays and take necessary action as per the job requirements 2.2 Conduct the functionality test, hardware test, measurement test to ensure proper functioning of relays as per the standard procedures 2.3 Check the tightness of relay contacts and tightened if necessary as per the job requirements
3. Complete the work	3.1 Maintain reports as per the standard operating procedures 3.2 Conduct test to ensure proper functioning as per the standard operating procedures 3.3 Ensure clean working environment as per the Standard Operating Procedures.

## RANGE STATEMENT

### PPE may include but not limited to:

- Working Dress
- Helmet
- Gloves
- Safety shoes
- Mask
- Safety belts

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

- Multi meter
- Screw driver set
- Relay Testing Kit

### Materials may include but not limited to:

- Insulation tape
- Wires lugs
- Brush
- Cloth

## 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, equipments, materials and documents.
- Candidate must complete the assessment in industry accepted time frame.

**Critical aspect**

- Conduct the functionality test, hardware test, measurement test to ensure proper functioning of relays as per the standard procedures

<b>UNDERPINNING KNOWLEDGE</b>	<b>UNDERPINNING SKILLS</b>
<ul style="list-style-type: none"><li>• Interpretation of drawings and specifications</li><li>• Measurement units</li><li>• Occupational Health and safety regulations (OHS)</li><li>• Company rules</li><li>• First Aids</li><li>• Types of relays</li><li>• Basic functions of relays</li><li>• Working principles of protection system</li></ul>	<ul style="list-style-type: none"><li>• Usage of tools and equipments</li><li>• Communication skills</li><li>• Work planning skills</li><li>• Team work</li><li>• Problem solving</li></ul>

**UNIT TITLE :** Maintain EOT Crane

**DESCRIPTOR:** This unit covers the competencies required to maintain EOT crane ensuring health and safety at workplaces

**CODE :** 3113-U11-L3

<b>ELEMENTS OF COMPETENCE</b>	<b>PERFORMANCE CRITERIA</b>
1. Prepare for work	1.1 Select and use Personal Protective Equipments(PPE) as per the job requirement 1.2 Select and use <b>tools and equipments</b> as per the job requirement 1.3 Select and use <b>materials</b> as per the job requirement
2. Maintain EOT Crane	2.1 Disconnect the system as per the job requirement 2.2 Check the conditions of motors and service faulty components as per the job requirement 2.3 Check and measure IR value as per the job requirement 2.4 Check the conditions of control circuit and power circuit and take necessary actions as per the job requirement 2.5 Check the conditions of nuts and bolts and tightened as per the job requirement 2.6 Perform crane operations test as per the job requirement
3. Complete the work	3.1 Maintain reports as per the standard operating procedures 3.2 Conduct test to ensure proper functioning as per the standard operating procedures 3.3 Ensure clean working environment as per the

## RANGE STATEMENT

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

- Pliers
- Screw driver
- Hand tool set
- Multi meter
- IR tester

### Materials may include but not limited to:

- CRC
- Grease
- Petroleum gel

## 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, equipments, materials and documents.
- Candidate must complete the assessment in industry accepted time frame.

### Critical aspect

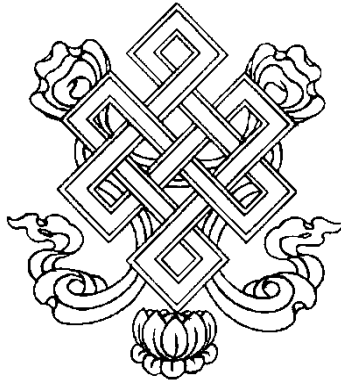
- Check the conditions of motors and service faulty components as per

the job requirement

- Check and measure IR value as per the job requirement
- Perform crane operations test as per the job requirement

<b>UNDERPINNING KNOWLEDGE</b>	<b>UNDERPINNING SKILLS</b>
<ul style="list-style-type: none"><li>• Drawings and specifications</li><li>• Occupational health and safety regulations</li><li>• First Aid</li><li>• Operating principles of EOT crane</li><li>• Types of motors</li><li>• Basic principles of contactors</li></ul>	<ul style="list-style-type: none"><li>• Use of tools and equipments</li><li>• Team Work</li><li>• Communication skills</li><li>• Problem Solving</li><li>• Planning</li><li>• Coordination</li></ul>





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](http://www.molhr.gov.bt)