

TRAINING REGULATIONS



Heavy-Equipment Operation (Tower Crane) NC II

CONSTRUCTION SECTOR

TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY
East Service Road, South Superhighway, Taguig City, Metro Manila

TOWER CRANE



TABLE OF CONTENTS

CONSTRUCTION - HEAVY EQUIPMENT SUB-SECTOR HEAVY EQUIPMENT OPERATION - TOWER CRANE

SECTION 1	HEAVY EQUIPMENT OPERATION QUALIFICATION
SECTION 2	COMPETENCY STANDARDS
SECTION 3	TRAINING STANDARDS
	3.1 Curriculum Design
	3.2 Training Delivery
	3.3 Trainee Entry Requirements
	3.4 List of Tools, Equipment and Materials
	3.5 Training Facilities
	3.6 Trainers' Qualifications
SECTION 4	ASSESSMENT AND CERTIFICATION ARRANGEMENT
	COMPETENCY MAP
	DEFINITION OF TERMS
	ACKNOWLEDGEMENTS

**TRAINING REGULATIONS FOR
HEAVY-EQUIPMENT OPERATION (TOWER CRANE) NC II**

SECTION 1 HEAVY-EQUIPMENT OPERATION - TOWER CRANE

The **HEAVY-EQUIPMENT OPERATION (TOWER CRANE) NC II** qualification consists of competencies that workers must achieve to enable them to perform tasks such as lifting and transferring of heavy loads in construction sites or other locations with the use of tower crane.

This qualification is packaged from the competency map of Construction - Heavy Equipment sub-sector as shown in Annex A.

The units of competency comprising this qualification include the following:

CODE NO. BASIC COMPETENCIES

Units of Competency

500311105	Participate in workplace communication
500311106	Work in a team environment
500311107	Practice career professionalism
500311108	Practice occupational health and safety procedures

CODE NO. COMMON COMPETENCIES

Units of Competency

CON931201	Prepare construction materials and tools
CON311201	Observe procedures, specifications and manuals of instruction
CON311202	Interpret technical drawings and plans
CON311203	Perform mensurations and calculations
CON311204	Maintain tools and equipment

CODE NO. CORE COMPETENCIES

CON833309	Perform pre- and post-operation procedures for lifting equipment
CON833314	Perform productive operation for tower crane

A person who has achieved this Qualification is competent to be a –

- Tower-crane operator

SECTION 2 COMPETENCY STANDARDS

This section gives the details and contents of the units of competency required in HEAVY-EQUIPMENT OPERATION (TOWER CRANE) NC II. These units of competency are categorized into basic, common and core competencies.

BASIC COMPETENCIES

UNIT OF COMPETENCY:	PARTICIPATE IN WORKPLACE COMMUNICATION
UNIT CODE :	500311105
UNIT DESCRIPTOR :	This unit covers the knowledge, skills and attitudes required to gather, interpret and convey information in response to workplace requirements.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Obtain and convey workplace information	1.1 Specific and relevant information is accessed from appropriate sources 1.2 Effective questioning , active listening and speaking skills are used to gather and convey information 1.3 Appropriate medium is used to transfer information and ideas 1.4 Appropriate non- verbal communication is used 1.5 Appropriate lines of communication with supervisors and colleagues are identified and followed 1.6 Defined workplace procedures for the location and storage of information are used 1.7 Personal interaction is carried out clearly and concisely
2. Participate in workplace meetings and discussions	2.1 Team meetings are attended on time 2.2 Own opinions are clearly expressed and those of others are listened to without interruption 2.3 Meeting inputs are consistent with the meeting purpose and established protocols 2.4 Workplace interactions are conducted in a courteous manner 2.5 Questions about simple routine workplace procedures and matters concerning working conditions of employment are asked and responded to 2.6 Meetings outcomes are interpreted and implemented

3. Complete relevant work related documents	<ul style="list-style-type: none">3.1 Range of forms relating to conditions of employment are completed accurately and legibly3.2 Workplace data is recorded on standard workplace forms and documents3.3 Basic mathematical processes are used for routine calculations3.4 Errors in recording information on forms/ documents are identified and properly acted upon3.5 Reporting requirements to supervisor are completed according to organizational guidelines
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RANGE OF VARIABLES

VARIABLE	RANGE
1. Appropriate sources	1.1. Team members 1.2. Suppliers 1.3. Trade personnel 1.4. Local government 1.5. Industry bodies
2. Medium	2.1. Memorandum 2.2. Circular 2.3. Notice 2.4. Information discussion 2.5. Follow-up or verbal instructions 2.6. Face to face communication
3. Storage	3.1. Manual filing system 3.2. Computer-based filing system
4. Forms	4.1. Personnel forms, telephone message forms, safety reports
5. Workplace interactions	5.1. Face to face 5.2. Telephone 5.3. Electronic and two way radio 5.4. Written including electronic, memos, instruction and forms, non-verbal including gestures, signals, signs and diagrams
6. Protocols	6.1. Observing meeting 6.2. Compliance with meeting decisions 6.3. Obeying meeting instructions

EVIDENCE GUIDE

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1. Prepared written communication following standard format of the organization 1.2. Accessed information using communication equipment 1.3. Made use of relevant terms as an aid to transfer information effectively 1.4. Conveyed information effectively adopting the formal or informal communication
<p>2. Underpinning Knowledge and Attitudes</p>	<ol style="list-style-type: none"> 2.1. Effective communication 2.2. Different modes of communication 2.3. Written communication 2.4. Organizational policies 2.5. Communication procedures and systems 2.6. Technology relevant to the enterprise and the individual's work responsibilities
<p>3. Underpinning Skills</p>	<ol style="list-style-type: none"> 3.1. Follow simple spoken language 3.2. Perform routine workplace duties following simple written notices 3.3. Participate in workplace meetings and discussions 3.4. Complete work related documents 3.5. Estimate, calculate and record routine workplace measures 3.6. Basic mathematical processes of addition, subtraction, division and multiplication 3.7. Ability to relate to people of social range in the workplace 3.8. Gather and provide information in response to workplace Requirements
<p>4. Resource Implications</p>	<ol style="list-style-type: none"> 4.1. Fax machine 4.2. Telephone 4.3. Writing materials 4.4. Internet
<p>5. Methods of Assessment</p>	<ol style="list-style-type: none"> 5.1. Direct Observation 5.2. Oral interview and written test
<p>6. Context of Assessment</p>	<ol style="list-style-type: none"> 6.1. Competency may be assessed individually in the actual workplace or through accredited institution

UNIT OF COMPETENCY:	WORK IN TEAM ENVIRONMENT
UNIT CODE	: 500311106
UNIT DESCRIPTOR	: This unit covers the skills, knowledge and attitudes to identify role and responsibility as a member of a team.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Describe team role and scope	1.1. The <i>role and objective of the team</i> is identified from available <i>sources of information</i> 1.2. Team parameters, reporting relationships and responsibilities are identified from team discussions and appropriate external sources
2. Identify own role and responsibility within team	2.1. Individual role and responsibilities within the team environment are identified 2.2. Roles and responsibility of other team members are identified and recognized 2.3. Reporting relationships within team and external to team are identified
3. Work as a team member	3.1. Effective and appropriate forms of communications used and interactions undertaken with team members who contribute to known team activities and objectives 3.2. Effective and appropriate contributions made to complement team activities and objectives, based on individual skills and competencies and <i>workplace context</i> 3.3. Observed protocols in reporting using standard operating procedures 3.4. Contribute to the development of team work plans based on an understanding of team's role and objectives and individual competencies of the members.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Role and objective of team	1.1. Work activities in a team environment with enterprise or specific sector 1.2. Limited discretion, initiative and judgement maybe demonstrated on the job, either individually or in a team environment
2. Sources of information	2.1. Standard operating and/or other workplace procedures 2.2. Job procedures 2.3. Machine/equipment manufacturer's specifications and instructions 2.4. Organizational or external personnel 2.5. Client/supplier instructions 2.6. Quality standards 2.7. OHS and environmental standards
3. Workplace context	3.1. Work procedures and practices 3.2. Conditions of work environments 3.3. Legislation and industrial agreements 3.4. Standard work practice including the storage, safe handling and disposal of chemicals 3.5. Safety, environmental, housekeeping and quality guidelines

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1. Operated in a team to complete workplace activity 1.2. Worked effectively with others 1.3. Conveyed information in written or oral form 1.4. Selected and used appropriate workplace language 1.5. Followed designated work plan for the job 1.6. Reported outcomes
<p>2. Underpinning Knowledge and Attitude</p>	<ol style="list-style-type: none"> 2.1. Communication process 2.2. Team structure 2.3. Team roles 2.4. Group planning and decision making
<p>3. Underpinning Skills</p>	<ol style="list-style-type: none"> 3.1. Communicate appropriately, consistent with the culture of the workplace
<p>4. Resource Implications</p>	<p>The following resources MUST be provided:</p> <ol style="list-style-type: none"> 4.1. Access to relevant workplace or appropriately simulated environment where assessment can take place 4.2. Materials relevant to the proposed activity or tasks
<p>5. Methods of Assessment</p>	<p>Competency may be assessed through:</p> <ol style="list-style-type: none"> 5.1. Observation of the individual member in relation to the work activities of the group 5.2. Observation of simulation and or role play involving the participation of individual member to the attainment of organizational goal 5.3. Case studies and scenarios as a basis for discussion of issues and strategies in teamwork
<p>6. Context for Assessment</p>	<ol style="list-style-type: none"> 6.1. Competency may be assessed in workplace or in a simulated workplace setting 6.2. Assessment shall be observed while task are being undertaken whether individually or in group

UNIT OF COMPETENCY:	PRACTICE CAREER PROFESSIONALISM
UNIT CODE :	500311107
UNIT DESCRIPTOR :	This unit covers the knowledge, skills and attitudes in promoting career growth and advancement.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Integrate personal objectives with organizational goals	1.1 Personal growth and work plans are pursued towards improving the qualifications set for the profession 1.2 Intra- and interpersonal relationships is are maintained in the course of managing oneself based on performance evaluation 1.3 Commitment to the organization and its goal is demonstrated in the performance of duties
2. Set and meet work priorities	2.1 Competing demands are prioritized to achieve personal, team and organizational goals and objectives. 2.2 Resources are utilized efficiently and effectively to manage work priorities and commitments 2.3 Practices along economic use and maintenance of equipment and facilities are followed as per established procedures
3. Maintain professional growth and development	3.1 Trainings and career opportunities are identified and availed of based on job requirements 3.2 Recognitions are -sought/received and demonstrated as proof of career advancement 3.3 Licenses and/or certifications relevant to job and career are obtained and renewed

RANGE OF VARIABLES

VARIABLE	RANGE
1. Evaluation	1.1 Performance Appraisal 1.2 Psychological Profile 1.3 Aptitude Tests
2. Resources	2.1 Human 2.2 Financial 2.3 Technology 2.3.1 Hardware 2.3.2 Software
3. Trainings and career opportunities	3.1 Participation in training programs 3.1.1 Technical 3.1.2 Supervisory 3.1.3 Managerial 3.1.4 Continuing Education 3.2 Serving as Resource Persons in conferences and workshops
4. Recognitions	4.1 Recommendations 4.2 Citations 4.3 Certificate of Appreciation 4.4 Commendations 4.5 Awards 4.6 Tangible and Intangible Rewards
5. Licenses and/or certifications	5.1 National Certificates 5.2 Certificate of Competency 5.3 Support Level Licenses 5.4 Professional Licenses

EVIDENCE GUIDE

1. Critical Aspects of Competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Attained job targets within key result areas (KRAs) 1.2 Maintained intra - and interpersonal relationship in the course of managing oneself based on performance evaluation 1.3 Completed trainings and career opportunities which are based on the requirements of the industries 1.4 Acquired and maintained licenses and/or certifications according to the requirement of the qualification
2. Underpinning Knowledge	<ul style="list-style-type: none"> 2.1 Work values and ethics (Code of Conduct, Code of Ethics, etc.) 2.2 Company policies 2.3 Company-operations, procedures and standards 2.4 Fundamental rights at work including gender sensitivity 2.4 Personal hygiene practices
3. Underpinning Skills	<ul style="list-style-type: none"> 3.1 Appropriate practice of personal hygiene 3.2 Intra and Interpersonal skills 3.3 Communication skills
4. Resource Implications	<p>The following resources MUST be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace or assessment location 4.2 Case studies/scenarios
5. Methods of Assessment	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> 5.1 Portfolio Assessment 5.2 Interview 5.3 Simulation/Role-plays 5.4 Observation 5.5 Third Party Reports 5.6 Exams and Tests
6. Context of Assessment	<ul style="list-style-type: none"> 6.1 Competency may be assessed in the work place or in a simulated work place setting

UNIT OF COMPETENCY : PRACTICE OCCUPATIONAL HEALTH AND SAFETY

PROCEDURES

UNIT CODE : **500311108**
UNIT DESCRIPTOR : This unit covers the outcomes required to comply with regulatory and organizational requirements for occupational health and safety.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Identify hazards and risks	1.1 Safety regulations and workplace safety and hazard control practices and procedures are clarified and explained based on organization procedures 1.2 Hazards/risks in the workplace and their corresponding indicators are identified to minimize or eliminate risk to co-workers, workplace and environment in accordance with organization procedures 1.3 Contingency measures during workplace accidents, fire and other emergencies are recognized and established in accordance with organization procedures
2. Evaluate hazards and risks	2.1 Terms of maximum tolerable limits which when exceeded will result in harm or damage are identified based on threshold limit values (TLV) 2.2 Effects of the hazards are determined 2.3 OHS issues and/or concerns and identified safety hazards are reported to designated personnel in accordance with workplace requirements and relevant workplace OHS legislation
3. Control hazards and risks	3.1 Occupational Health and Safety (OHS) procedures for controlling hazards/risks in workplace are consistently followed 3.2 Procedures for dealing with workplace accidents, fire and emergencies are followed in accordance with organization OHS policies 3.3 Personal protective equipment (PPE) is correctly used in accordance with organization OHS procedures and practices 3.4 Appropriate assistance is provided in the event of a workplace emergency in accordance with established organization protocol

4. Maintain OHS awareness	4.1 Emergency-related drills and trainings are participated in as per established organization guidelines and procedures 4.2 OHS personal records are completed and updated in accordance with workplace requirements
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RANGE OF VARIABLES

VARIABLE	RANGE
1. Safety regulations	May include but are not limited to: 1.1 Clean Air Act 1.2 Building code 1.3 National Electrical and Fire Safety Codes 1.4 Waste management statutes and rules 1.5 Philippine Occupational Safety and Health Standards 1.6 DOLE regulations on safety legal requirements 1.7 ECC regulations
2. Hazards/Risks	May include but are not limited to: 2.1 Physical hazards – impact, illumination, pressure, noise, vibration, temperature, radiation 2.2 Biological hazards- bacteria, viruses, plants, parasites, mites, molds, fungi, insects 2.3 Chemical hazards – dusts, fibers, mists, fumes, smoke, gasses, vapors 2.4 Ergonomics 2.4.1 Psychological factors – over exertion/ excessive force, awkward/static positions, fatigue, direct pressure, varying metabolic cycles 2.4.2 Physiological factors – monotony, personal relationship, work out cycle
3. Contingency measures	May include but are not limited to: 3.1 Evacuation 3.2 Isolation 3.3 Decontamination 3.4 (Calling designed) emergency personnel
4. PPE	May include but are not limited to: 4.1 Mask 4.2 Gloves 4.3 Goggles 4.4 Hair Net/cap/bonnet 4.5 Face mask/shield 4.6 Ear muffs 4.7 Apron/Gown/coverall/jump suit 4.8 Anti-static suits

<p>5. Emergency-related drills and training</p>	<p>5.1 Fire drill 5.2 Earthquake drill 5.3 Basic life support/CPR 5.4 First aid 5.5 Spillage control 5.6 Decontamination of chemical and toxic 5.7 Disaster preparedness/management</p>
<p>6. OHS personal records</p>	<p>6.1 Medical/Health records 6.2 Incident reports 6.3 Accident reports 6.4 OHS-related training completed</p>

EVIDENCE GUIDE

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Explained clearly established workplace safety and hazard control practices and procedures 1.2 Identified hazards/risks in the workplace and its corresponding indicators in accordance with company procedures 1.3 Recognized contingency measures during workplace accidents, fire and other emergencies 1.4 Identified terms of maximum tolerable limits based on threshold limit value- TLV. 1.5 Followed Occupational Health and Safety (OHS) procedures for controlling hazards/risks in workplace 1.6 Used Personal Protective Equipment (PPE) in accordance with company OHS procedures and practices 1.7 Completed and updated OHS personal records in accordance with workplace requirements
<p>2. Underpinning Knowledge and Attitude</p>	<ul style="list-style-type: none"> 2.1 OHS procedures and practices and regulations 2.2 PPE types and uses 2.3 Personal hygiene practices 2.4 Hazards/risks identification and control 2.5 Threshold Limit Value -TLV 2.6 OHS indicators 2.7 Organization safety and health protocol 2.8 Safety consciousness 2.9 Health consciousness
<p>3. Underpinning Skills</p>	<ul style="list-style-type: none"> 3.1 Practice of personal hygiene 3.2 Hazards/risks identification and control skills 3.3 Interpersonal skills 3.4 Communication skills
<p>4. Resource Implications</p>	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace or assessment location 4.2 OHS personal records 4.3 PPE 4.4 Health records

5. Methods of Assessment	Competency may be assessed through: 5.1 Portfolio Assessment 5.2 Interview 5.3 Case Study/Situation
6. Context for Assessment	6.1 Competency may be assessed in the work place or in a simulated work place setting

COMMON COMPETENCIES

UNIT OF COMPETENCY:	PREPARE CONSTRUCTION MATERIALS AND TOOLS
UNIT CODE :	CON931201
UNIT DESCRIPTOR :	This unit covers the knowledge, skills and attitudes on identifying, requesting and receiving construction materials and tools based on the required performance standards.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variable
1. Identify materials	1.1 Materials are listed as per job requirements 1.2 Quantity and description of materials conform with the job requirements 1.3 Tools and accessories are identified according to job requirements
2. Requisition materials	2.1 Materials and tools needed are requested according to the list prepared 2.2 Request is done as per company standard operating procedures (SOP) 2.2 Substitute materials and tools are provided without sacrificing cost and quality of work
3. Receive and inspect materials	3.1 Materials and tools issued are inspected as per quantity and specification 3.2 Tools, accessories and materials are checked for damages according to enterprise procedures 3.3 Materials and tools are set aside to appropriate location nearest to the workplace

RANGE OF VARIABLES

VARIABLE	RANGE
1. Materials and Tools	1.1 Electrical supplies 1.2 Structural 1.3 Plumbing 1.4 Welding/pipefitting 1.5 Carpentry 1.6 Masonry
2. Description of Materials and Tools	2.1 Brand name 2.2 Size 2.3 Capacity 2.4 Kind of application
3. Company standard procedures	3.1 Job order 3.2 Requisition slip 3.3 Borrower slip

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Listed materials and tools according to quantity and job requirements 1.2 Requested materials and tools according to the list prepared and as per company SOP 1.3 Inspected issued materials and tools as per quantity and job specifications 1.4 Tools provided with appropriate safety devices
<p>2. Underpinning knowledge</p>	<ul style="list-style-type: none"> 2.1 Types and uses of construction materials and tools 2.2 Different forms 2.3 Requisition procedures
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Preparing materials and tools 3.2 Proper handling of tools and equipment 3.3 Following instructions
<p>4. Resource implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace location 4.2 Materials relevant to the unit of competency 4.3 Technical plans, drawings and specifications relevant to the activities
<p>5. Methods of assessment</p>	<p>Competency in this unit must be assessed through:</p> <ul style="list-style-type: none"> 5.1 Direct observation and oral questioning
<p>6. Context of assessment</p>	<ul style="list-style-type: none"> 6.1 Competency may be assessed in the workplace or in a simulated workplace 6.2 Competency assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines

UNIT OF COMPETENCY:	OBSERVE PROCEDURES, SPECIFICATIONS AND MANUALS OF INSTRUCTIONS
UNIT CODE :	CON311201
UNIT DESCRIPTOR :	This unit covers the knowledge, skills and attitudes on identifying, interpreting, applying services to specifications and manuals and storing manuals.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Identify and access specification/manuals	1.1 Appropriate manuals are identified and accessed as per job requirements 1.2 Version and date of manual are checked to ensure that correct specification and procedures are identified
2. Interpret manuals	2.1 Relevant sections, chapters of specifications/ manuals are located in relation to the work to be conducted 2.2 Information and procedure in the manual are interpreted in accordance with industry practices
3. Apply information in manual	3.1 <i>Manual</i> is interpreted according to job requirements 3.2 Work steps are correctly identified in accordance with manufacturer's specification 3.3 Manual data are applied according to the given task 3.4 All correct sequencing and adjustments are interpreted in accordance with information contained on the manual or specifications
4. Store manuals	4.1 Manual or specification is stored appropriately to prevent damage, ready access and updating of information when required in accordance with company requirements

RANGE OF VARIABLES

VARIABLE	RANGE
1. Procedures, Specifications and Manuals of Instructions	Kinds of Manuals: 1.1 Manufacturer's Specification Manual 1.2 Repair Manual 1.3 Maintenance Procedure Manual 1.4 Periodic Maintenance Manual

EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires that the candidate:</p> <ul style="list-style-type: none"> 1.1 Identified and accessed specification/manuals as per job requirements 1.2 Interpreted manuals in accordance with industry practices 1.3 Applied information in manuals according to the given task 1.4 Stored manuals in accordance with company requirements
2. Underpinning knowledge	<ul style="list-style-type: none"> 2.1 Types of manuals used in construction sector 2.2 Identification of symbols used in the manuals 2.3 Identification of units of measurements 2.4 Unit conversion
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Reading and comprehension skills required to identify and interpret construction manuals and specifications 3.2 Accessing information and data
4. Resource implications	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 All manuals/catalogues relative to construction sector
5. Methods of assessment	<p>Competency should be assessed through:</p> <ul style="list-style-type: none"> 5.1 Direct observation 5.2 Questions/interview <p>Assessment of underpinning knowledge and practical skills may be combined</p>
6. Context of assessment	<ul style="list-style-type: none"> 6.1 Competency assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines 6.2 Assessment may be conducted in the workplace or a simulated environment

UNIT OF COMPETENCY:	INTERPRET TECHNICAL DRAWINGS AND PLANS
UNIT CODE :	CON311202
UNIT DESCRIPTOR :	This unit covers the knowledge, skills and attitudes on analyzing and interpreting symbols, data and work plan based on the required performance standards.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Analyze signs, symbols and data	1.1 Technical plans are obtained according to job requirements 1.2 Signs, symbols and data are identified according to job specifications 1.3 Signs symbols and data are determined according to classification or as appropriate in drawing
2. Interpret technical drawings and plans	2.1 Necessary tools, materials and equipment are identified according to the plan 2.2 Supplies and materials are listed according to specifications 2.3 Components, assemblies or objects are recognized as required 2.4 Dimensions are identified as appropriate to the plan 2.5 Specification details are matched with existing/available resources and in line with job requirements 2.6 Work plan is drawn following the specifications
3. Apply freehand sketching	3.1 Where applicable, correct freehand sketching is produced in accordance with the job requirements

RANGE OF VARIABLES

VARIABLE	RANGE
1. Technical plans	Including but not limited to: 1.1 Electrical plans 1.2 Structural plans 1.3 Architectural plans 1.4 Plumbing plans 1.5 Welding Procedures Specifications (WPS)
2. Work plan	2.1 Job requirements 2.2 Installation instructions 2.3 Components instruction
3. Classification	Including but not limited to: 3.1 Electrical 3.2 Mechanical 3.3 Plumbing
4. Drawing	4.1 Drawing symbols 4.2 Alphabet of lines 4.3 Orthographic views - Front view - Right side view/left side view - Top view - Pictorial 4.4 Schematic diagram 4.5 Electrical drawings 4.6 Structural drawings 4.7 Plumbing drawings - Water - Sewerage/Drainage - Ventilation 4.8 Welding symbols
5. Tools and materials	Including but not limited to: 5.1 Compass 5.2 Divider 5.3 Rulers 5.4 Triangles 5.5 Drawing tables 5.6 Computer

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires that the candidate:</p> <ul style="list-style-type: none"> 1.1 Identified and determined signs, symbols and data according to work plan, job requirements and classifications 1.2 Identified tools and equipment in accordance with job requirements 1.3 Listed supplies and materials according to blueprint specifications 1.4 Drawn workplan following specifications 1.5 Determined job specifications based on working/technical drawing
<p>2. Underpinning knowledge</p>	<ul style="list-style-type: none"> 2.1 TRADE MATHEMATICS <ul style="list-style-type: none"> 2.1.1 Linear measurement 2.1.2 Dimension 2.1.3 Unit conversion 2.2 BLUEPRINT READING AND PLAN SPECIFICATION <ul style="list-style-type: none"> 2.2.1 Electrical, mechanical plan, symbols and abbreviations 2.2.2 Drawing standard symbols 2.3 TRADE THEORY <ul style="list-style-type: none"> 2.3.1 Basic technical drawing 2.3.2 Types technical plans 2.3.3 Various types of drawings 2.3.4 Notes and specifications
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Interpreting drawing/orthographic drawing 3.2 Interpreting technical plans 3.3 Matching specification details with existing resources 3.4 Following instructions 3.5 Handling of drawing instruments
<p>4. Resource implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace 4.2 Drawings and specification relevant to task 4.3 Materials and instrument relevant to proposed activity
<p>5. Methods of assessment</p>	<p>Competency should be assessed through:</p> <ul style="list-style-type: none"> 5.1 Direct observation 5.2 Questions/interview 5.3 Written test related to underpinning knowledge

6. Context of assessment	6.1 Competency assessment may occur in the workplace or in any appropriate simulated environment 6.2 Assessment shall be observed while task are being undertaken whether individually or in group 6.3 Competency assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines
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UNIT OF COMPETENCY:	PERFORM MENSURATIONS AND CALCULATIONS
UNIT CODE :	CON311203
UNIT DESCRIPTOR :	This unit covers the knowledge, skills and attitudes on identifying and measuring objects based on the required performance standards.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms are elaborated in the Range of Variable</i>
1. Select measuring instruments	1.1 Object or component to be measured is identified, classified and interpreted according to the appropriate regular <i>geometric shape</i> 1.2 Measuring tools are selected/identified as per object to be measured or job requirements 1.3 Correct specifications are obtained from relevant sources 1.4 Appropriate measuring instruments are selected according to job requirements 1.5 Alternative measuring tools are used without sacrificing cost and quality of work
2. Carry out measurements and calculations	2.1 Accurate <i>measurements</i> are obtained according to job requirements 2.3 Alternative measuring tools are used without sacrificing cost and quality of work 2.4 <i>Calculation</i> needed to complete work tasks are performed using the four basic process of addition (+), subtraction (-), multiplication (x) and division (/) including but not limited to: trigonometric functions, algebraic computations 2.5 Calculations involving fractions, percentages and mixed numbers are used to complete workplace tasks 2.6 Numerical computation is self-checked and corrected for accuracy 2.7 Instruments are read to the limit of accuracy of the tool 2.8 Systems of measurement identified and converted according to job requirements/ISO 2.9 Workpieces are measured according to job requirements

RANGE OF VARIABLES

VARIABLE	RANGE
1. Geometric shape	Including but is not limited to: 1.1 Round 1.2 Square 1.3 Rectangular 1.4 Triangle 1.5 Sphere 1.6 Conical
2. Measuring instruments	Including but not limited to: 2.1 Micrometer (In-out, depth) 2.2 Vernier caliper (out, inside) 2.3 Dial gauge with mag, std. 2.4 Straight edge 2.5 Thickness gauge 2.6 Torque gauge 2.7 Small hole gauge 2.8 Telescopic gauge 2.9 Try-square 2.10 Protractor 2.11 Combination gauge 2.12 Steel rule 2.13 Voltmeter 2.14 Ammeter 2.15 Mega-ohmeter 2.16 Kilowatt hour meter 2.17 Gauges 2.18 Thermometers
3. Measurements and calculations	3.1 Linear 3.2 Volume 3.3 Area 3.4 Wattage 3.5 Voltage 3.6 Resistance 3.7 Amperage 3.8 Frequency 3.9 Impedance

VARIABLE	RANGE
	3.10 Conductance 3.11 Capacitance 3.12 Displacement 3.13 Inside diameter 3.14 Circumference 3.15 Length 3.16 Thickness 3.17 Outside diameter 3.18 Taper 3.19 Out of roundness 3.20 Oil clearance 3.21 End play/Thrust clearance

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires that the candidate:</p> <ul style="list-style-type: none"> 1.1 Selected and prepared appropriate measuring instruments in accordance with job requirements 1.2 Performed measurements and calculations according to job requirements/ ISO
<p>2. Underpinning knowledge</p>	<p>2.1 TRADE MATHEMATICS / MENSURATION</p> <ul style="list-style-type: none"> 2.1.1 Four fundamental operation 2.1.2 Linear measurement 2.1.3 Dimensions 2.1.4 Unit conversion 2.1.5 Ratio and proportion 2.1.6 Trigonometric functions 2.1.7 Algebraic equations
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Performing calculation by addition, subtraction, multiplication and division; trigonometric functions and algebraic equations 3.2 Visualizing objects and shapes 3.3 Interpreting formulas for volume, areas, perimeters of plane and geometric figures 3.4 Proper handling of measuring instruments
<p>4. Resource implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace location 4.2 Problems to solve 4.3 Measuring instrument appropriate to carry out tasks 4.4 Instructional materials relevant to the propose activity <p>Assessment of underpinning knowledge and practical skills may be combined</p>
<p>5. Methods of assessment</p>	<p>Competency should be assessed through:</p> <ul style="list-style-type: none"> 5.1 Actual demonstration 5.2 Direct observation 5.3 Written test/questioning related to underpinning knowledge
<p>6. Context of assessment</p>	<ul style="list-style-type: none"> 6.1 Competency assessment may occur in workplace or any appropriate simulated environment 6.2 Assessment shall be observed while task are being undertaken whether individually or in group 6.3 Competency assessment must be undertaken in accordance with the TESDA assessment guidelines

UNIT OF COMPETENCY:	MAINTAIN TOOLS AND EQUIPMENT
UNIT CODE :	CON311204
UNIT DESCRIPTOR :	This unit covers the knowledge, skills and attitudes on checking condition, performing preventive maintenance and storing of tools and equipment based on the required performance standards.

ELEMENTS	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Check condition of tools and equipment	1.1 Materials, tools and equipment are identified according to classification and job requirements 1.2 Non-functional tools and equipment are segregated and labeled according to classification 1.3 Safety of tools and equipment are observed in accordance with manufacturer's instructions 1.4 Condition of PPE are checked in accordance with manufacturer's instructions
2. Perform basic preventive maintenance	2.1 Appropriate lubricants are identified according to types of equipment 2.2 Tools and equipment are lubricated according to preventive maintenance schedule or manufacturer's specifications 2.2 Measuring instruments are checked and calibrated in accordance with manufacturer's instructions 2.4 Tools are cleaned and lubricated according to standard procedures 2.5 Defective instruments, equipment and accessories are inspected and replaced according to manufacturer's specifications 2.6 Tools are inspected, repaired and replaced after use 2.7 Work place is cleaned and kept in safe state in line with OHSA regulations

<p>3. Store tools and equipment</p>	<p>3.1 Inventory of tools, instruments and equipment are conducted and recorded as per company practices</p> <p>3.2 Tools and equipment are stored safely in appropriate locations in accordance with manufacturer's specifications or company procedures</p>
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RANGE OF VARIABLES

VARIABLE	RANGE
1. Materials	Including but not limited to: 1.1 Lubricants 1.2 Cleaning materials 1.3 Rust remover 1.4 Rugs 1.5 Spare parts
2. Tools and equipment	Including but not limited to: 2.1 Tools <ul style="list-style-type: none"> - Cutting tools - hacksaw, crosscut saw, rip saw - Boring tools - auger, brace, grinlet, hand drill - Holding tools - vise grip, C-clamp, bench vise - Threading tools - die and stock, taps 2.2 Measuring instruments/equipment
3. PPE	Including but not limited to: 3.1 Goggles 3.2 Gloves 3.3 Safety shoes 3.4 Aprons/Coveralls
4. Forms	4.1 Maintenance schedule forms 4.2 Requisition slip 4.3 Inventory Form 4.4 Inspection Form 4.5 Procedures

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires that the candidate:</p> <ul style="list-style-type: none"> 1.1 Selected and used appropriate processes, tools and equipment to carry out task 1.2 Identified functional and non-functional tools and equipment 1.3 Checked, lubricated and calibrated tools, equipment and instruments according to manufacturer's specifications 1.4 Replaced defective tools, equipment and their accessories 1.5 Observed and applied safe handling of tools and equipment and safety work practices 1.6 Prepared and submitted inventory report, where applicable 1.7 Maintained workplace in accordance with OHSA regulations 1.8 Stored tools and equipment safely in appropriate locations and in accordance with company practices
<p>2. Underpinning knowledge</p>	<ul style="list-style-type: none"> 2.1 SAFETY PRACTICES <ul style="list-style-type: none"> 2.1.1 Use of PPE 2.1.2 Handling of tools and equipment 2.1.3 Good housekeeping 3.2 MATERIALS, TOOLS AND EQUIPMENT <ul style="list-style-type: none"> 2.2.1 Types and uses of lubricants 2.2.2 Types and uses of cleaning materials 2.2.3 Types and uses of measuring instruments and equipment 3.3 PREVENTIVE MAINTENANCE <ul style="list-style-type: none"> 2.3.1 Methods and techniques 2.3.2 Procedures
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Preparing maintenance materials, tools and equipment 3.2 Proper handling of tools and equipment 3.3 Performing preventive maintenance 3.3 Following instructions
<p>4. Resource implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace 4.2 Maintenance schedule 4.2 Maintenance materials, tools and equipment relevant to the proposed activity/task

5. Methods of assessment	Competency should be assessed through: 5.1 Direct observation 5.2 Written test/questioning relevant to Underpinning knowledge
6. Context of assessment	6.1 Competency assessment may occur in workplace or any appropriate simulated environment 6.2 Competency assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines

CORE COMPETENCIES

UNIT OF COMPETENCY:	PERFORM PRE- AND POST-OPERATION PROCEDURES FOR LIFTING EQUIPMENT
UNIT CODE:	CON833309
UNIT DESCRIPTOR:	This unit involves knowledge, skills and attitudes in performing procedures before and after productive operation of lifting equipment.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms are elaborated in the Range of Variables</i>
1. Perform visual check of equipment	1.1 Lifting equipment is selected based on job requirements. 1.2 Operator-serviceable (OS) parts are checked in accordance with equipment checklist and manufacturer's procedures. 1.3 Walk-around check is performed with equipment checklist and with engine stopped/not running.
2. Perform "B L O W A F" check	2.1 "BLOWAF" check is performed with checklist form and with engine stopped/not running. 2.2 Fluid levels are maintained in accordance with equipment maintenance manual. 2.3 Abnormal conditions noted in checklist and reported to authorized person .
3. Perform operation check	3.1 Starting/running check is performed with checklist and in accordance with manufacturer's recommendations. 3.2 Brake, steering and controls are checked for normal functioning as per manufacturer's specifications. 3.3 Walk-around check is performed with equipment checklist and while engine is running. 3.4 Safety devices are checked for proper functions in accordance with safe operating procedures.

ELEMENT	PERFORMANCE CRITERIA
4. Perform post-operation procedures	<p>4.1 Equipment is parked and turned off after productive operation in accordance with company rules and regulations.</p> <p>4.2 Equipment controls are set into neutral position and parking brakes are engaged according to manufacturer's operations manual.</p> <p>4.3 Safety locks and brakes are all set/engaged in accordance with operator's manual.</p> <p>4.4 Walk-around inspection check is re-conducted while doing engine cool down</p> <p>4.5 Daily equipment time record/report (DETR) is accomplished/submitted according to company rules and regulations</p>

RANGE OF VARIABLES

VARIABLE	RANGE
1. Lifting equipment	1.1 Rough Terrain Crane 1.2 Crawler Crane 1.3 Truck Mounted Crane 1.4 Forklift 1.4.1 Diesel 1.4.2 Gasoline or LPG 1.4.3 Electric 1.5 Tower Crane 1.5.1 Fixed Mounted 1.5.2 Rail Mounted 1.5.3 Self Erecting/Climbing Type 1.5.4 Free Standing Type 1.5.5 Luffing type
2. Lifting capacity	2.1 2.5 - 3.5 tons 2.2 5 - 10 tons 2.3 15 - 25 tons 2.4 35 tons and above
3. Operator serviceable parts (OS)	3.1 Air cleaner 3.2 Battery terminals/Connection/Clamp/Case 3.3 Belt/Lifting Chain 3.4 Grease/lube points 3.5 Fuel water separator/radiator <u>Rough Terrain Crane, Truck Mounted Crane, Forklift</u> 3.6 Tire inflation <u>Forklift</u> 3.7 Fuel tank 3.8 Hydraulic and brake master cylinder 3.9 Engine oil fan 3.10 Lights 3.11 Steering/Suspension <u>Crawler Crane</u> 3.12 Track tension

VARIABLE	RANGE
4. Walk-around check	4.1 Engine off <ul style="list-style-type: none"> 4.1.1 Leaks 4.1.2 Worn out/damaged parts 4.1.3 Fluid levels 4.1.4 Loose parts and accessories (nuts/bolts/belts) 4.1.5 Missing parts and accessories 4.1.6 Pulleys (gantry and boom end) <u>Rough Terrain Crane, Crawler Crane, Truck Mounted Crane and Tower Crane</u> <ul style="list-style-type: none"> 4.1.7 Hook block assembly <ul style="list-style-type: none"> 4.1.7.1 Sheaves 4.1.7.2 Hook and latch 4.1.8 Wire rope cable/clip <u>Forklift</u> <ul style="list-style-type: none"> 4.1.9 Fork condition 4.1.10 Fork chain/bearing 4.1.11 Levers and controls <ul style="list-style-type: none"> 4.1.11.1 Hoist 4.1.11.2 Tilt 4.1.11.3 Side shift 4.1.11.3 Steering wheels 4.1.11.4 Pedals 4.1.11.5 Hand brake <u>Forklift and Tower crane</u> <ul style="list-style-type: none"> 4.1.12 Counter weight <u>Tower crane</u> <ul style="list-style-type: none"> 4.1.13 Base foundation 4.1.14 Mask pins <u>Crawler Crane</u> <ul style="list-style-type: none"> 4.1.15 Lattice boom (main and jib)

	<p>4.2 Engine on <u>Rough Terrain Crane, Truck Mounted Crane and Forklift</u> 4.2.1 Gauges and controls 4.2.2 Safety devices <u>Rough Terrain Crane and Truck Mounted Crane</u> 4.2.3 Oil and air leaks 4.2.4 Working equipment function 4.2.4.1 Outriggers 4.2.4.2 Boom 4.2.4.3 Hoist <u>Forklift</u> 4.2.4.4 Tilt 4.2.4.5 Lift 4.2.4.6 Steering 4.2.4.7 Cylinder</p>
<p>5. <u>B L O W A F</u> check</p>	<p><u>Rough Terrain Crane, Crawler Crane, Truck Mounted Crane and Forklift</u> 5.1 Battery (starting and charging system) 5.2 Light (lighting system) 5.3 Oil (lubricating system) 5.4 Water (cooling system) 5.5 Air (intake and exhaust system) 5.6 Fuel (fuel system)</p>
<p>6. Fluid levels</p>	<p><u>Rough Terrain Crane, Crawler Crane, Truck Mounted Crane and Forklift</u> 6.1 Engine oil 6.2 Hydraulic oil 6.3 Radiator coolant/radiator (maintenance type) 6.4 Battery electrolyte/distilled water <u>Rough Terrain Crane, Crawler Crane, and Truck Mounted Crane</u> 6.5 Brake/clutch fluid <u>Rough Terrain Crane and Forklift</u> 6.6 Transmission/Gear oil <u>Rough Terrain Crane and Truck Mounted Crane</u> 6.7 Steering oil <u>Truck Mounted Crane</u> 6.8 Fuel <u>Forklift</u> 6.9 Torque converter oil</p>

RANGE	VARIABLE
7. Authorized person	7.1 Equipment Supervisor 7.2 Equipment Dispatcher/Foreman 7.3 Maintenance personnel
8. Starting/Running check/operation check	8.1 Controls 8.1.1 Travel <u>Rough Terrain Crane, Crawler Crane, Truck Mounted Crane and Tower Crane</u> 8.1.2 Hoist <u>Rough Terrain Crane, Crawler Crane and Truck Mounted Crane</u> 8.1.3 Swing 8.1.4 Outrigger 8.1.5 Boom <u>Forklift</u> 8.1.6. Tilt 8.1.7 Lift 8.1.8 Steering 8.1.9 Side shift 8.1.10 Stabilizer
	8.2 Gauges 8.2.1 Hour meter <u>Rough Terrain, Crawler Crane, Truck Mounted Crane and Forklift</u> 8.2.2 Battery charging 8.2.3 Pressure (oil and air) 8.2.4 Temperature (oil and water) 8.2.5 RPM (Tachometer) <u>Rough Terrain, Crawler Crane, Truck Mounted and Tower Crane</u> 8.2.6 Boom angle indicator <u>Rough Terrain Crane, Crawler Crane, Truck Mounted Crane and Forklift</u> 8.2.7 Fuel indicator <u>Rough Terrain Crane, Truck Mounted Crane, Forklift and Tower Crane</u> 8.2.8 Speedometer <u>Forklift</u> 8.2.9 Hydraulic pressure 8.3 Leaks in <u>Rough Terrain Crane, Crawler Crane, Truck Mounted Crane and Forklift</u> 8.3.1 Fuel

VARIABLE	RANGE
	<p>8.3.2 Hydraulic <u>Terrain Crane, Crawler Crane, Truck Mounted Crane and Tower Crane</u></p> <p>8.3.3 Lubricating <u>Rough Terrain Crane, Crawler Crane and Truck Mounted Crane</u></p> <p>8.3.4 Air</p> <p>8.3.5 Cooling <u>Forklift and Tower Crane</u></p> <p>8.3.6 Oil <u>Forklift</u></p> <p>8.3.7 Water</p> <p>8.3.8 Brake fluid</p> <p>8.4 Electrical/switches</p> <p>8.4.1 Lights</p> <p>8.4.2 Horns</p> <p>8.4.3 Wiper <u>Rough Terrain Crane, Crawler Crane, Truck Mounted Crane and Forklift</u></p> <p>8.5 Steering and brake</p>
9. Safety devices	<p><u>Rough Terrain Crane, Crawler Crane, Truck Mounted Crane and Tower Crane</u></p> <p>9.1 Load moment indicator (LMI)</p> <p>9.2 Anti two block (Limit switch) <u>Rough Terrain Crane, Crawler Crane, and Truck Mounted Crane</u></p> <p>9.3 Automatic crane stopper (ACS) <u>Forklift and Tower Crane</u></p> <p>9.4 Emergency stop switch <u>Forklift</u></p> <p>9.5 Back horn/warning horn</p> <p>9.6 Signal/stop light</p> <p>9.7 Blinkers</p> <p>9.8 Safety belt</p> <p>9.9 Overhead guard protector</p> <p>9.10 Fork lock/tow pin lock</p> <p>9.11 Parking brake</p>

VARIABLE	RANGE
	<u>Tower Crane</u> 9.12 Limit switch <ul style="list-style-type: none"> 9.12.1 Hoisting 9.12.2 Slewing 9.12.3 Travelling 9.12.4 Trolleying 9.12.5 Derricking 9.13 Weather vaning devices 9.14 Beacon lights 9.15 Lighting arrester
10. Safety locks	10.1 Swing lock 10.2 House lock 10.3 Control lever lock 10.4 Door lock <u>Tower Crane</u> 10.5 Slewing lock 10.6 Travelling ock

EVIDENCE GUIDE

<p>1. Critical aspects of evidence to be considered</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Demonstrates ability to select equipment based on the job requirements 1.2 Demonstrates ability to check operator-serviceable (OS) parts 1.3 Demonstrates ability to perform walk-around and “BLOWAF” inspection following equipment checklist and with engine stopped/not running. 1.4 Demonstrates ability to perform walk-around check while engine is running 1.5 Demonstrates ability to observe risk-control/safe procedures 1.6 Demonstrates ability to perform post-operation checking procedures 1.7 Demonstrates ability to accomplish and submit daily equipment time report (DETR)
<p>2. Underpinning (related) knowledge</p>	<ul style="list-style-type: none"> 2.1 Types and uses of personal protective equipment (PPE) 2.2 Controls, instruments, indicators and their usage 2.3 Start-up and shutdown procedures 2.4 Use of manufacturer’s operation manuals 2.5 Familiarity with job site and work conditions 2.6 Familiarity with pre- and post-operation checklist
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Performing pre- and post-operation procedures of equipment using standard or special attachments 3.2 Using personal protective equipment 3.3 Maintaining equipment records 3.4 Communicating with work site personnel and clients 3.5 Complying with the manufacturer’s operation and maintenance manual 3.6 Accomplishing pre- and post-operation checklist
<p>4. Resource implications</p>	<p>Things necessary for the conduct of assessment</p> <ul style="list-style-type: none"> 4.1 Appropriate work area for lifting equipment operation 4.2 Access to lifting equipment and manuals.
<p>5. Method of assessment</p>	<p>Competency must be assessed through</p> <ul style="list-style-type: none"> 5.1 Written/oral questioning 5.2 Direct observation / practical demonstration 5.3 Work record and documents
<p>6. Context for assessment</p>	<ul style="list-style-type: none"> 6.1 Assessment may be conducted on-the-job or in a simulated venue.

UNIT OF COMPETENCY:	PERFORM PRODUCTIVE OPERATION FOR TOWER CRANE
UNIT CODE:	CON833314
UNIT DESCRIPTOR:	This unit covers the knowledge, skills and attitudes in performing equipment standard operating procedures for a Tower Crane.

ELEMENT	PERFORMANCE CRITERIA <i>Bold and Italicized terms are elaborated in the Range of Variables</i>
1. Position the crane	1.1 Work area is surveyed for safe accessibility or potential hazards in accordance with safe operating procedures. 1.2 Jib is secured in place during positioning (applied to rail mounted type). 1.3 Aid of a signalman is required. 1.4 Unexpected situations are responded in line with company rules and regulations in a manner that minimizes risk to personnel and equipment.
2. Read and interpret load chart	2.1 Gross weight is determined according to load information . 2.2 Lifting capacity is determined according to working radius and boom length. 2.3 Rigging gears specifications are determined according to lifting plan. 2.4 Weight of any attachment such as hook blocks, lifting/rigging gears, etc. is considered as part of the load. 2.5 Lifting capacity in the load chart is followed according to manufacturer's specifications and equipment conditions (Safe Working Load). 2.6 Doubt about the lifting capacity of the crane based on load chart reading is referred to immediate supervisor.

ELEMENT	PERFORMANCE CRITERIA
<p>3. Perform lifting and transferring of load</p>	<p>3.1 Communication signal with Rigger is established and maintained during lifting and transferring of loads based on job requirements.</p> <p>3.2 Speed and allowable working radius during hoisting, slewing or trolleying operation are controlled based on standard operating procedures.</p> <p>3.3 Safe work procedures and practices are observed during lifting and transferring operation</p> <p>3.4 Unexpected situations are responded to in line with company safety rules and regulations.</p>

RANGE OF VARIABLES

VARIABLE	RANGE
1. Potential hazards	May include but are not limited to: 1.1 Other equipment 1.2 Building/structure 1.3 Overhead “live” electrical wires 1.4 Foggy/windy or stormy weather
2. Signalman	2.1 Spotter 2.2 Rigger
3. Unexpected situations	May include but are not limited to: 3.1 Oil leakages 3.2 Fraying of wire rope 3.3 Lost of power supply 3.4 Failure of hoist brake 3.5 Malfunction of control levers/electrical components 3.6 Structural failure of the jib 3.7 Derail of track (for rail mounted type) 3.8 Ground failure 3.9 Hitting high tension wire 3.10 Force majeure e.g., earthquake, fire, tornado 3.11 Sudden sickness/unstable health condition of operator
4. Load information	4.1 Bill of ladings 4.2 Packing and shipping list 4.3 Manufacturer’s load specifications
5. Rigging gears specifications	5.1 Types and classifications 5.2 Weight 5.3 Proper hitching or application 5.4 Capacity
6. Equipment condition	Equipment lifting condition may include but are not limited to: 6.1 Obsolescence (expected life span) 6.2 Equipment history 6.3 Machine performance 6.4 Wear and tear 6.5 Structural reliability

VARIABLE	RANGE
7. Communication signal	7.1 Two-way radio 7.2 Hand signal (ISO standard) 7.3 Radio headset 7.4 Cellular phones
8. Safe work procedures and practices	8.1 Ensure that lifting/rigging gears are placed, checked and secured before raising the load in accordance with job requirements. 8.2 Load striking the ground, machine or any other object is prevented. 8.3 Jib and hoist line are prevented from striking any obstruction. 8.4 Shock/Dynamic loading is avoided. 8.5 Load handling is observed.
9. Lifting and transferring operation	9.1 Release emergency brake 9.2 Release slewing lock 9.3 Hoist the load 9.4 Trolley the load 9.5 Slew the load 9.6 Raise and lower the jib (for luffing crane)

EVIDENCE GUIDE

<p>1. Critical aspects of evidence to be considered</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Demonstrates ability to operate Tower Crane in accordance with manufacturer's operation and maintenance manual. 1.2 Demonstrates ability to carry-out safe work procedures and practices 1.3 Demonstrates ability to interpret Load Chart, Lifting/Rigging plan 1.4 Demonstrates ability to communicate with Rigger during lifting operation 1.5 Demonstrates ability to follow correct procedures in lifting and transferring loads.
<p>2. Underpinning (related) knowledge and attitude</p>	<ul style="list-style-type: none"> 2.1 Safe operating procedures and practices. 2.2 Load charts 2.3 Lifting/rigging plans/site plan and layout 2.4 Company/In-house policies and procedures 2.5 Rigging gears and signals (ISO standards) and its applications 2.6 Basic calculations and mensuration 2.7 Positive work values (time and cost conscious, etc.)
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> 3.1 Accomplishing crane inspection checklist and daily equipment time record/report (DETR) 3.2 Reporting crane component malfunctions 3.3 Performing actual/proper crane operation 3.4 Performing safety procedures and practices 3.5 Reading and interpreting load chart 3.6 Following correct rigging signals (ISO standard) 3.7 Calculation and mensuration skills
<p>4. Resource implications</p>	<p>Things necessary for the conduct of assessment</p> <ul style="list-style-type: none"> 4.1 Access to Tower Crane and job site/terrain 4.2 Rigging gears and test loads 4.3 Signalman 4.4 Barricades and informative signages

5. Method of assessment	Competency in this unit must be assessed through 5.1 Written/Oral questioning 5.2 Direct observation/ demonstration 5.3 Work record and documents 5.4 Third-party report
6. Context for assessment	6.1 Assessment maybe conducted in the work site or in a simulated venue.

SECTION 3 TRAINING STANDARDS

These guidelines are set to provide the Technical and Vocational Education and Training (TVET) providers with information and other important requirements to consider when designing training programs for HEAVY EQUIPMENT OPERATION NC II.

3.1 CURRICULUM DESIGN

Course Title : HEAVY- EQUIPMENT OPERATION (TOWER CRANE)

NC Level: II

BASIC COMPETENCIES

Nominal Training Hours: 18 Hours (Basic) + 18 Hours (Common)

Course Description:

This course is designed to equip individuals with the basic, common and core competencies in Construction Sector particularly in Heavy-Equipment Operation (Tower Crane).

To obtain this, all units prescribed for this qualification must be achieved:

BASIC COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Participate in workplace communication	1.1 Obtain and convey workplace information. 1.2 Complete relevant work related documents 1.3 Participate in workplace meeting and discussion.	Group discussion Interaction	<ul style="list-style-type: none">• Demonstration• Observation• Interviews/ questioning
2. Work in a team environment	2.1 Describe and identify team role and responsibility in a team. 2.2 Describe work as a team member.	Discussion Interaction	<ul style="list-style-type: none">• Demonstration• Observation• Interviews/ questioning

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
3. Practice career professionalism	3.1 Integrate personal objectives with organizational goals. 3.2 Set and meet work priorities. 3.3 Maintain professional growth and development.	Discussion Interaction	<ul style="list-style-type: none"> • Demonstration • Observation • Interviews/ questioning
4. Practice occupational health and safety	4.1 Evaluate hazard and risks 4.2 Control hazards and risks 4.3 Maintain occupational health and safety awareness	Discussion Plant tour Symposium	<ul style="list-style-type: none"> • Observation • Interview

COMMON COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Prepare construction materials and tools	1.8 Identify Materials 1.9 Requisition Materials 1.10 Receive and inspect materials	Audio Visual simulation Discussion Practical exercise Demonstration	<ul style="list-style-type: none"> • Direct observation • Questions or interview • Portfolio (credentials) • Written / Oral Test • Demonstration
2. Observe procedures, Specifications and Manuals of Instructions	2.1 Identify and access specification/ manuals	Audio Visual Simulation Discussion Practical Lab Demonstration	<ul style="list-style-type: none"> • Direct observation • Oral questioning • Written test or examination • Third party report • Demonstration (able to impart knowledge and skills)
3. Interpret Technical Drawing	3.1 Analyze sign, symbols and data 3.2 Interpret technical drawing and plans 3.3 Apply freehand sketching	Audio Visual Simulation Discussion Practical Lab Demonstration	<ul style="list-style-type: none"> • Direct observation • Oral questioning • Written test or examination • Third party report • Demonstration (able to impart knowledge and skills)
4. Perform mensurations and calculation	4.1 Select measuring instruments 4.2 Carry out measurements and calculations	Audio Visual Simulation Discussion Practical Lab Demonstration	<ul style="list-style-type: none"> • Direct observation • Oral questioning • Written test or examination • Third party report • Demonstration (able to impart knowledge and skills)

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
5. Maintain tools and equipment	5.1 Check condition of tools and equipment 5.2 Perform basic preventive maintenance 5.3 Sharpen edge and tooth cutting tools 5.4 Store tools and equipment	Audio Visual Simulation Discussion Practical Lab Demonstration	<ul style="list-style-type: none"> • Direct observation of application of tasks • Oral questioning • Written test or examination • Third party report • Demonstration

CORE COMPETENCIES

Course Title : HEAVY EQUIPMENT OPERATION
TOWER CRANE

Level:

Nominal Training Hours: 120 Hours

Course Description:

This course is designed to enhance the knowledge, desirable attitudes and skills in the use of tower crane in accordance with industry standards. It covers core competencies such as: perform pre- and post operation procedure, and perform productive operation on a given tower crane.

To obtain this, all units prescribed for this qualification must be achieved:

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Perform pre- and post operation procedures on Tower Crane	1.1 Identify tower crane types / components parts 1.2 Perform visual check of equipment 1.3 Check BLOWAF of Tower Crane 1.3.1 Battery 1.3.2 Light 1.3.3 Oil 1.3.4 Water 1.3.5 Air 1.3.6 Fuel 1.4 Check tower crane systems operation 1.5 Check safety devices & accessories 1.6 Perform post-operations check	Lecture Practical / demonstration	<ul style="list-style-type: none"> • Observation / Demonstration and interview • Written test
2. Perform productive operation for Tower Crane	2.1 Perform loading and unloading tower crane to trailer (low bed) 2.2 Perform tower - crane application	Lecture Practical demonstration	<ul style="list-style-type: none"> • Observation / Demonstration and interview • Written test

3.2 TRAINING DELIVERY

The delivery of training should adhere to the design of the curriculum. Delivery should be guided by the 10 basic principles of competency-based TVET.

- The training is based on curriculum developed from the competency standards;
- Learning is modular in its structure;
- Training delivery is individualized and self-paced;
- Training is based on work that must be performed;
- Training materials are directly related to the competency standards and the curriculum modules;
- Assessment is based in the collection of evidence of the performance of work to the industry required standard;
- Training is based both on and off-the-job components;
- Allows for recognition of prior learning (RPL) or current competencies;
- Training allows for multiple entry and exit; and
- Approved training programs are nationally accredited.

The competency-based TVET system recognizes various types of delivery modes, both on and off-the-job as long as the learning is driven by the competency standards specified by the industry. The following training modalities may be adopted when designing training programs:

- The dualized mode of training delivery is preferred and recommended. Thus programs would contain both in-school and in-industry training or fieldwork components. Details can be referred to the Dual Training System (DTS) Implementing Rules and Regulations.
- Modular/self-paced learning is a competency-based training modality wherein the trainee is allowed to progress at his own pace. The trainer facilitates the training delivery
- Peer teaching/mentoring is a training modality wherein fast learners are given the opportunity to assist the slow learners.
- Supervised industry training or on-the-job training is an approach in training designed to enhance the knowledge and skills of the trainee through actual experience in the workplace to acquire specific competencies prescribed in the training regulations.
- Distance learning is a formal education process in which majority of the instruction occurs when the students and

instructor are not in the same place. Distance learning may employ correspondence study, or audio, video or computer technologies.

3.3 TRAINEE ENTRY REQUIREMENTS

This section specifies the qualifications of trainees and educational experience. Other requirements like health and physical requirements may also be stated. Passing written entrance examinations may also be indicated if necessary.

- Can communicate both orally and in writing
- Physically and mentally fit
- With good moral character
- Can perform basic mathematical computations.

3.4 LIST OF TOOLS, EQUIPMENT AND MATERIALS

Recommended list of tools, equipment and materials for the training of 25 trainees for the operation of tower crane.

TOOLS		EQUIPMENT		MATERIALS	
QTY		QTY		QTY	
1 set	• Wrenches (box and open-end 8-24 mm-metric & 7/16 –1” - English)	1 unit	• Tower crane(MOA / rental)	5 kls	• Multi-purpose grease
1 set	• Hammer ballpeen (3-4 lbs)			1 pair	• Working clothes
1 set	• Pliers(mechanical 10 “)			10 pairs	• Safety shoes
1 pc	• Adjustable wrench (18 “)				
1 pc	• Grease gun			10 pairs	• Gloves
1 set	• Screw driver (10 “ flat & Philips)			10 pcs	• Goggles
				10 pcs	• Dust Mask
				10 pcs	• Hard hat
				2 units	• Test weights - 3 tons - 5 tons
				1 pc	• Tower crane miniture
				1 pc	• Operator’s manual with load chart

3.5 TRAINING FACILITIES

The tower crane operation workshop must be of concrete structure. Based on class size of 25 students/trainees the space requirements for the teaching/learning and circulation areas are as follows:

SPACE REQUIREMENT	SIZE IN METERS	AREA IN SQ. METERS	TOTAL AREA IN SQ. METERS
• Student/Trainee's Working Space	2.0 x 2.0 meters	4 sq.m per student	100.0 sq.m.
• Lecture Room	8.00 x 6.00	48.00	48.0
• Learning Resource Center	4.00 x 6.00	24.00	24.0
•			172
• Facilities/Equipment/ Circulation Area	-	-	52
TOTAL WORK AREA	-		224
Working field	0.25 hectare (MOA/Rental)		

3.6 TRAINERS' QUALIFICATION HEAVY EQUIPMENT OPERATION (LIFTING)

TRAINER QUALIFICATION (TQ II)

- Must be a holder of Heavy-Equipment Operation (Tower Crane) NC-II or equivalent qualification
- Must have undergone training on Training Methodology II (TM II) or equivalent in training/experience
- Must be computer-literate
- Must be physically and mentally fit
- Must have had at least 5 years job/industry experience*
- Must be a civil-service eligible or holder of appropriate license issued by the Professional Regulatory Commission (for government positions)

* Optional. Only when required by the hiring institution.

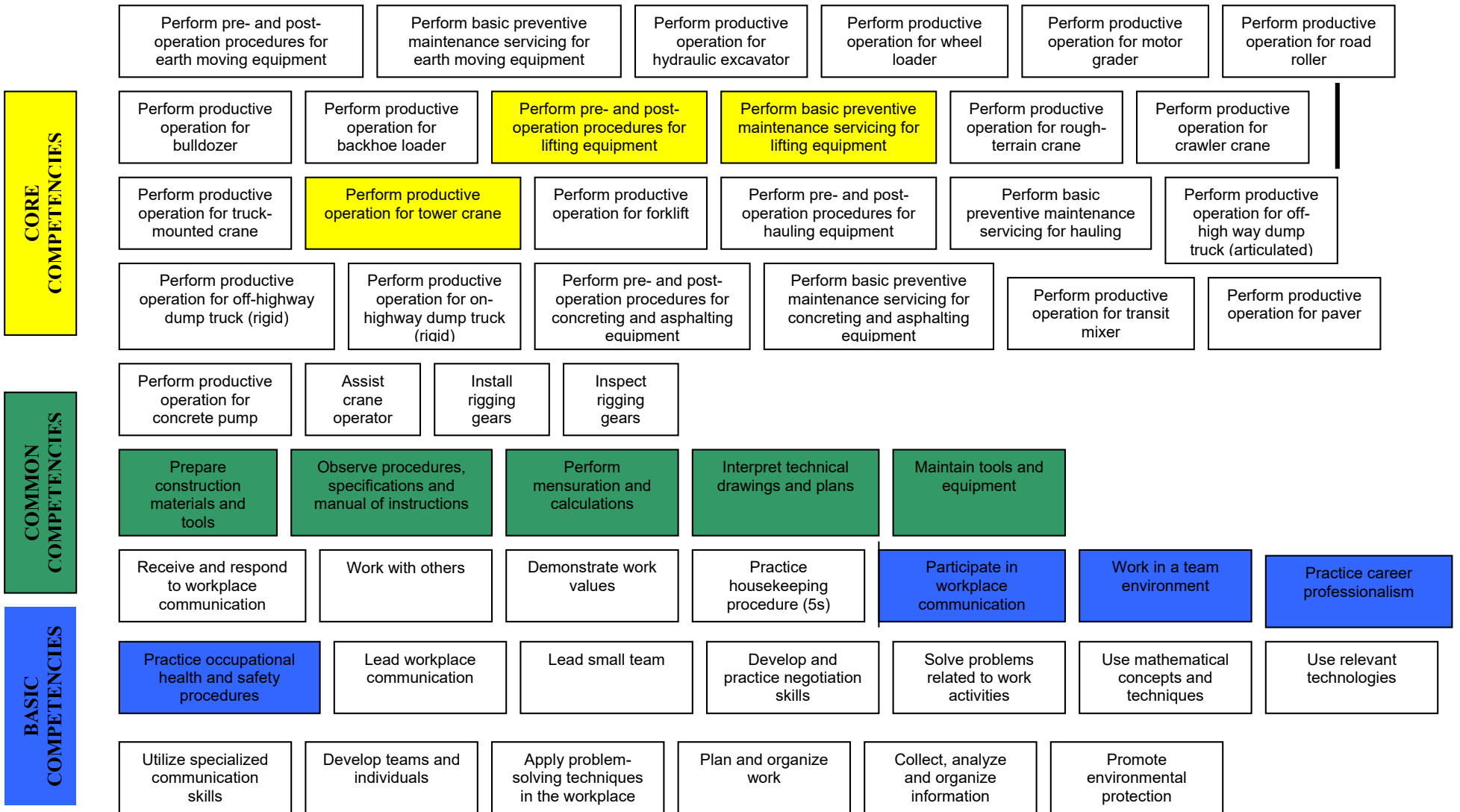
Reference: TESDA Board Resolution No. 2004-03

SECTION 4 NATIONAL ASSESSMENT AND CERTIFICATION ARRANGEMENTS

- 4.1 To attain the National Qualification of HEAVY-EQUIPMENT OPERATION (Tower Crane) NC II, the candidate must demonstrate competence in all the units of competency in Section 1. Successful candidates shall be awarded National Certificates signed by the TESDA Director General.
- 4.2 The qualification of **HEAVY EQUIPMENT OPERATION (Bulldozer) NC II** may be attained through demonstration of competence in a project-type assessment covering the following core units.
 - 4.2.1 **Tower-crane operation**
 - Perform pre-and post operation for lifting equipment
 - Perform productive operation for tower crane
- 4.3 Assessment shall focus on the core units of competency. The basic and common units shall be integrated or assessed concurrently with the core units.
- 4.4 The following are qualified to apply for assessment and certification:
 - 4.4.1 Graduates of formal, non-formal and/or informal training including enterprise-based training programs
 - 4.4.2 Experienced Workers (wage-employed or self-employed)
- 4.5 The guidelines on assessment and certification are discussed in detail in the *Procedures Manual on Assessment and Certification* and *Guidelines on the Implementation of the Philippine TVET Qualification and Certification System (PTQCS)*.

COMPETENCY MAP

CONSTRUCTION-HEAVY EQUIPMENT OPERATION SUB- SECTOR



Definition of Terms

For the purpose of this Competency Standard, the words

1. Attachment Refers to anything like hook block and other accessories/special attachments used instead of the conventional lift block to perform different types of lifting jobs.
2. Derricking Refers to raising and lowering of jib for luffing type of Tower crane.
3. Hoist Refers to the mechanism that is used for raising and lowering the load.
4. Jib Refers to the boom of the Tower crane. It is a long horizontal working arm of the crane that carries the load.
5. Safe Working Load (SWL) Refers to the maximum allowable load that the crane can lift safely.
6. Slewing Refers to the transferring of load by swinging the jib from left to right.
7. Slewing unit Attached on top of the mast that allows the crane to rotate.
8. Tower Crane Refers to the type of crane that is used for high rise buildings/ structures or construction sites which are of fixed base mounted, rail mounted, self erecting/climbing type, free standing type and luffing type, used for lifting construction materials.
9. Trolleying Refers to the movement of the load in and out from the crane center.
10. Weathervaning device Refers to a safety device to free the jib movement during adverse weather conditions.

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