TRAINING REGULATIONS

Heavy-Equipment Operation (Crawler Crane) NC II

CONSTRUCTION SECTOR

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

CRAWLER CRANE

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SECTION 1 HEAVY-EQUIPMENT OPERATION (CRAWLER CRANE) NC II

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

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
CON833310	Perform basic preventive maintenance servicing for lifting equipment
CON833313	Perform productive operation for crawler crane

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

- Crawler-crane operator

SECTION 2 COMPETENCY STANDARDS

This section gives the details and contents of the core units of competency required in HEAVY EQUIPMENT OPERATION - CRAWLER CRANE. 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 ***Italicized*** 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	3.1 Range of ***forms*** relating to conditions of employment are completed accurately and legibly 3.2 Workplace data is recorded on standard workplace forms and documents 3.3 Basic mathematical processes are used for routine calculations 3.4 Errors in recording information on forms/ documents are identified and properly acted upon 3.5 Reporting requirements to supervisor are completed according to organizational guidelines

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

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 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
2. Underpinning Knowledge and Attitudes	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
3. Underpinning Skills	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
4. Resource Implications	4.1. Fax machine 4.2. Telephone 4.3. Writing materials 4.4. Internet
5. Methods of Assessment	5.1. Direct Observation 5.2. Oral interview and written test
6. Context of Assessment	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 ***Italicized*** terms are elaborated in the Range of Variables
1. Describe team role and scope	1.1. The ***role and objective of the team*** is identified from available ***sources of information*** 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 ***workplace context*** 3.3. Observed protocols in reporting using standard operating procedures 3.4. Contribute to the development of teamwork 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

1. Critical aspects of competency	Assessment requires evidence that the candidate: 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
2. Underpinning Knowledge and Attitude	2.1. Communication process 2.2. Team structure 2.3. Team roles 2.4. Group planning and decision making
3. Underpinning Skills	3.1. Communicate appropriately, consistent with the culture of the workplace
4. Resource Implications	The following resources MUST be provided: 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
5. Methods of Assessment	Competency may be assessed through: 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
6. Context for Assessment	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** ***Italicized*** 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	Assessment requires evidence that the candidate:

Competency	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	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	3.1 Appropriate practice of personal hygiene 3.2 Intra and Interpersonal skills 3.3 Communication skills
4. Resource Implications	The following resources **MUST** be provided: 4.1 Workplace or assessment location 4.2 Case studies/scenarios
5. Methods of Assessment	Competency may be assessed through: 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	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 ***Italicized*** 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

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

5. Emergency-related drills and training	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
6. OHS personal records	6.1 Medical/Health records 6.2 Incident reports 6.3 Accident reports 6.4 OHS-related training completed

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 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
2. Underpinning Knowledge and Attitude	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
3. Underpinning Skills	3.1 Practice of personal hygiene 3.2 Hazards/risks identification and control skills 3.3 Interpersonal skills 3.4 Communication skills
4. Resource Implications	The following resources must be provided: 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 ***Italicized*** 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

1. Critical aspects of competency	Assessment requires evidence that the candidate: 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
2. Underpinning knowledge	2.1 Types and uses of construction materials and tools 2.2 Different forms 2.3 Requisition procedures
3. Underpinning skills	3.1 Preparing materials and tools 3.2 Proper handling of tools and equipment 3.3 Following instructions
4. Resource implications	The following resources should be provided: 4.1 Workplace location 4.2 Materials relevant to the unit of competency 4.3 Technical plans, drawings and specifications relevant to the activities
5. Methods of assessment	Competency in this unit must be assessed through: 5.1 Direct observation and oral questioning
6. Context of assessment	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 ***Italicized*** 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 ***Manual*** 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	Assessment requires that the candidate: 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	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	3.1 Reading and comprehension skills required to identify and interpret construction manuals and specifications 3.2 Accessing information and data
4. Resource implications	The following resources should be provided: 4.1 All manuals/catalogues relative to construction sector
5. Methods of assessment	Competency should be assessed through: 5.1 Direct observation 5.2 Questions/interview Assessment of underpinning knowledge and practical skills may be combined
6. Context of assessment	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 ***Italicized*** 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

1. Critical aspects of competency	Assessment requires that the candidate: 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
2. Underpinning knowledge	**2.1 TRADE MATHEMATICS** 2.1.1 Linear measurement 2.1.2 Dimension 2.1.3 Unit conversion 2.2 **BLUEPRINT READING AND PLAN SPECIFICATION** 2.2.1 Electrical, mechanical plan, symbols and abbreviations 2.2.2 Drawing standard symbols **2.3 TRADE THEORY** 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
3. Underpinning skills	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
4. Resource implications	The following resources should be provided: 4.1 Workplace 4.2 Drawings and specification relevant to task 4.3 Materials and instrument relevant to proposed activity
5. Methods of assessment	Competency should be assessed through: 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

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 ***Italicized** terms* are elaborated in the Range of Variable
1. Select measuring instruments	1.1 Object or component to be measured is identified, classified and interpreted according to the appropriate regular ***geometric shape*** 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 ***measurements*** are obtained according to job requirements 2.3 Alternative measuring tools are used without sacrificing cost and quality of work 2.4 ***Calculation*** 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

1. Critical aspects of competency	Assessment requires that the candidate: 1.1 Selected and prepared appropriate measuring instruments in accordance with job requirements 1.2 Performed measurements and calculations according to job requirements/ ISO
2. Underpinning knowledge	**2.1 TRADE MATHEMATICS / MENSURATION** 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
3. Underpinning skills	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
4. Resource implications	The following resources should be provided: 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 Assessment of underpinning knowledge and practical skills may be combined
5. Methods of assessment	Competency should be assessed through: 5.1 Actual demonstration 5.2 Direct observation 5.3 Written test/questioning related to underpinning knowledge
6. Context of assessment	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.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Check condition of tools and equipment	1.1 ***Materials, tools and equipmen***t 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

ELEMENT	PERFORMANCE CRITERIA
3. Store tools and equipment	3.1 Inventory of tools, instruments and equipment are conducted and recorded as per company practices 3.2 Tools and equipment are stored safely in appropriate locations in accordance with manufacturer's specifications or company procedures

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 - 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

1. Critical aspects of competency	Assessment requires evidence that the candidate: 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
2. Underpinning knowledge	**2.1 SAFETY PRACTICES** 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** 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** 2.3.1 Methods and techniques 2.3.2 Procedures
3. Underpinning skills	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
4. Resource implications	The following resources should be provided: 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/Demonstration 5.2 Written test/Oral 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 ***Italicized*** *terms are elaborated* in the Range of Variables
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	4.1 Equipment is parked and turned off after productive operation in accordance with company rules and regulations. 4.2 Equipment controls are set into neutral position and parking brakes are engaged according to manufacturer's operations manual. 4.3 ***Safety locks*** and brakes are all set/engaged in accordance with operator's manual. 4.4 Walk-around inspection check is re-conducted while doing engine cool down 4.5 Daily equipment time record/report (DETR) is accomplished/submitted according to company rules and regulations

RANGE OF VARIABLES

VARIABLE	RANGE
1. Lifting	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 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> 4.1.7 Hook block assembly 4.1.7.1 Sheaves 4.1.7.2 Hook and latch 4.1.8 Wire rope cable/clip <u>Forklift</u> 4.1.9 Fork condition 4.1.10 Fork chain/bearing 4.1.11 Levers and controls 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> 4.1.12 Counter weight <u>Tower crane</u> 4.1.13 Base foundation 4.1.14 Mask pins <u>Crawler Crane</u> 4.1.15 Lattice boom (main and jib)

	4.2 Engine on Rough-Terrain Crane, Truck-Mounted Crane and Forklift 4.2.1 Gauges and controls 4.2.2 Safety devices Rough-Terrain Crane and Truck-Mounted Crane 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 Forklift 4.2.4.4 Tilt 4.2.4.5 Lift 4.2.4.6 Steering 4.2.4.7 Cylinder
5. B L O W A F check	Rough-Terrain Crane, Crawler Crane, Truck-Mounted Crane and Forklift 5.1 **B**attery (starting and charging system) 5.2 **L**ight (lighting system) 5.3 **O**il (lubricating system) 5.4 **W**ater (cooling system) 5.5 **A**ir (intake and exhaust system) 5.6 **F**uel (fuel system)
6. Fluid levels	Rough-Terrain Crane, Crawler Crane, Truck-Mounted Crane and Forklift 6.1 Engine oil 6.2 Hydraulic oil 6.3 Radiator coolant/radiator (maintenance type) 6.4 Battery electrolyte/distilled water Rough-Terrain Crane, Crawler Crane, and Truck-Mounted Crane 6.5 Brake/clutch fluid Rough-Terrain Crane and Forklift 6.6 Transmission/Gear oil Rough-Terrain Crane and Truck-Mounted Crane 6.7 Steering oil Truck-Mounted Crane 6.8 Fuel Forklift 6.9 Torque converter oil

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 Rough-Terrain Crane, Crawler Crane, Truck-Mounted Crane and Tower Crane 8.1.2 Hoist Rough-Terrain Crane, Crawler Crane and Truck-Mounted Crane 8.1.3 Swing 8.1.4 Outrigger 8.1.5 Boom Forklift 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 Rough-Terrain, Crawler Crane, Truck-Mounted Crane and Forklift 8.2.2 Battery charging 8.2.3 Pressure (oil and air) 8.2.4 Temperature (oil and water) 8.2.5 RPM (Tachometer) Rough-Terrain, Crawler Crane, Truck-Mounted and Tower Crane 8.2.6 Boom angle indicator Rough-Terrain Crane, Crawler Crane, Truck-Mounted Crane and Forklift 8.2.7 Fuel indicator Rough-Terrain Crane, Truck-Mounted Crane, Forklift and Tower Crane 8.2.8 Speedometer Forklift 8.2.9 Hydraulic pressure 8.3 Leaks in Rough-Terrain Crane, Crawler Crane, Truck-Mounted Crane and Forklift 8.3.1 Fuel

	8.3.2 Hydraulic Rough-Terrain Crane, Crawler Crane, Truck-Mounted Crane and Tower Crane 8 3.3 Lubricating Rough-Terrain Crane, Crawler Crane and Truck-Mounted Crane 8.3.4 Air 8.3.5 Cooling Forklift and Tower Crane 8.3.6 Oil Forklift 8.3.7 Water 8.3.8 Brake fluid 8.4 Electrical/switches 8.4.1 Lights 8.4.2 Horns 8.4.3 Wiper Rough-Terrain Crane, Crawler Crane, Truck-Mounted Crane and Forklift 8.5 Steering and brake
9. Safety devices	Rough-Terrain Crane, Crawler Crane, Truck-Mounted Crane and Tower Crane 9.1 Load moment indicator (LMI) 9.2 Anti two block (Limit switch) Rough-Terrain Crane, Crawler Crane, and Truck-Mounted Crane 9.3 Automatic crane stopper (ACS) Forklift and Tower Crane 9.4 Emergency stop switch Forklift 9.5 Back horn/warning horn 9.6 Signal/stop light 9.7 Blinkers 9.8 Safety belt 9.9 Overhead guard protector 9.10 Fork lock/tow pin lock 9.11 Parking brake

	Tower Crane 9.12 Limit switch 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 Tower Crane 10.5 Slewing lock 10.6 Travelling lock

EVIDENCE GUIDE

1. Critical aspects of evidence to be considered	Assessment requires evidence that the candidate: 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)
2. Underpinning (related) knowledge and attitude	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 Familiarity with manufacturer's operation manual 2.5 Familiarity with job site and work conditions 2.6 Familiarity with pre- and post-operation checklist
3. Underpinning skills	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
4. Resource implications	Things necessary for the conduct of assessment 4.1 Appropriate work area for lifting equipment operation 4.2 Access to lifting equipment and manuals.
5. Method of assessment	Competency must be assessed through 5.1 Written/oral questioning 5.2 Observation of practical demonstration 5.3 Work record and documents
6. Context for assessment	6.1 Assessment may be conducted on-the-job or in a simulated venue.

UNIT OF COMPETENCY:	**PERFORM BASIC PREVENTIVE MAINTENANCE SERVICING FOR LIFTING EQUIPMENT**
UNIT CODE:	**CON833310**
UNIT DESCRIPTOR:	This unit involves the knowledge, skills and attitudes required in conducting routine basic preventive maintenance for ***lifting equipment***.

ELEMENT	PERFORMANCE CRITERIA ***Bold and Italicized*** terms are elaborated in the Range of Variables
1. Perform adjustment/s replacements	1.1 ***Minor defects*** are identified and remedied in accordance with company/manufacturer's procedures. 1.2 Tools are selected based on job requirements. 1.3 ***Major defects*** are identified using check list and referred to ***appropriate personnel*** for action.
2. Perform basic preventive maintenance servicing (PMS)	2.1 ***OS parts***/***standards*** are identified and serviced according to manufacturer's recommendations. 2.2 ***Fluids and lubricants*** are used based on manufacturer's manual. 2.3 ***Basic hand tools and equipment*** and consumable materials are identified and used in accordance with job requirements. 2.4 ***Basic preventive maintenance servicing (PMS)*** is carried out in accordance with manufacturer's recommendations and/or ***site requirements/ conditions***.
3. Prepare equipment reports	3.1 Daily checklist form is accomplished in accordance with manufacturer's/company requirements. 3.2 Minor/major equipment defects are reported to appropriate personnel.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Lifting equipment	1.1 Rough Terrain Crane 1.2 Truck Mounted Crane 1.3 Crawler Crane 1.4 Forklift 1.4.1 Diesel 1.4.2 Gasoline/LPG 1.4.3 Electric
2. Minor defects	2.1 Weak battery 2.2 Air lock 2.3 Tire inflation 2.4 Belt tension 2.5 Clogged air cleaner 2.6 Defective radiator cap <u>Forklift</u> 2.7 Loose clamps. Bolts and mountings 2.8 Presence of water in fuel separator
3. Major defects	3.1 Busted hydraulic hose 3.2 Hard starting engine 3.3 Excessive engine oil consumption 3.4 Leakage on 3.4.1 Air 3.4.2 Fuel 3.4.3 Cooling 3.4.4 Hydraulic system 3.5 Faulty gauges 3.6 Damaged/broken pulley 3.7 Incorrect/defective Load Moment Indicator (LMI) 3.8 Defective/frayed wire rope <u>Rough-Terrain Crane and Truck-Mounted Crane</u> 3.9 Busted/flat tires <u>Rough-Terrain Crane and Crawler Crane</u> 3.10 Derailed track links <u>Forklift</u> 3.11 Excessive engine oil consumption on: 3.11.1 Fuel 3.11.2 Water 3.11.3 Fluid 3.12 Poor engine performance 3.13 Weak brakes

VARIABLE	RANGE
	3.14 Defective electrical components 3.14.1 Charging 3.14.2 Lighting 3.14.3 Starting 3.14.4 Monitoring/gauges
4. Appropriate personnel	4.1 Equipment supervisor/Foreman 4.2 Chief mechanic 4.3 Equipment maintenance personnel <u>Forklift</u> 4.4 Dispatcher 4.5 Motor pool supervisor
5. Operator Serviceable (OS) parts	5.1 Battery clamps 5.2 Belts 5.3 Filters 5.3.1 Air cleaner 5.3.2 Water fuel separator/drain valve 5.4 All fluid caps 5.5 All grease points and fittings 5.6 Wire rope grease/lubricants <u>Forklift</u> 5.7 Battery distilled water 5.8 Chain grease 5.9 All caps (e.g., water, oil, fluid, fuel)
6. Standards	6.1 Oil pressure 6.2 Air pressure 6.3 Temperatures 6.4 Tension 6.5 Clearance and distances <u>Forklift</u> 6.6 Hydraulic pressure 6.7 Fuels 6.7.1 LPG 6.7.2 Diesel 6.7.3 Gasoline 6.7.4 Electric 6.8 Charging rate

VARIABLE	RANGE
7. Fluids and lubricants	7.1 Engine oil 7.2 Hydraulic oil 7.3 Brake fluid 7.4 Multi-purpose grease 7.5 Coolant 7.6 Battery solutions Rough Terrain Crane and Truck Mounted Crane 7.7 Transmission oil Truck Mounted Crane 7.8 Fuel Forklift 7.9 Gear oil 7.10 Cleaning solutions 7.10.1 Detergent soap 7.10.2 Degreaser
8. Basic hand tools and equipment	8.1 Hand tools 8.1.1 Wrenches 8.1.2 Pliers 8.1.3 Paint brush 8.1.4 Grease gun 8.1.5 Hammer 8.1.6 Vice grip 8.1.7 Measuring tape (instrument) 8.1.8 Steel brush Rough Terrain Crane and Crawler Crane 8.1.9 Screw driver (positive and negative) Truck Mounted Crane and Forklift 8.1.10 Screw driver (Philips and flat tip) Rough Terrain Crane and Truck Mounted Crane 8.1.11 Tire gauge (instrument) Crawler Crane 8.1.12 Mud removing tools 8.2 Equipment 8.2.1 High pressure washer 8.2.2 Air compressor

VARIABLE	RANGE
9. Basic preventive maintenance servicing	May include but are not limited to: 9.1 Check battery clamps 9.2 Check fan belt conditions (cracked or worn-out) 9.3 Adjust belt tensions (if necessary) 9.4 Clean/Replace filters 9.4.1 Air cleaner 9.4.2 Water separator 9.5 Replace defective fluid caps 9.6 Grease all fittings on lube points 9.7 Grease wire ropes
10. Site condition/ requirements	10.1 Instructions 10.2 Signages 10.3 Work schedules 10.4 Work bulletin boards 10.5 Charts 10.6 Memos 10.7 Maps 10.8 Dusty 10.9 Windy 9.10 Terrain (muddy and slippery) <u>Forklift</u> 9.11 Poor lighting 9.12 Vertical clearance 9.13 Overhead cable 9.14 Toxic/hazardous fumes

EVIDENCE GUIDE

1. Critical aspects of evidence to be considered	Assessment requires evidence that the candidate: 1.1 Demonstrates ability to observe safety precautions 1.2 Demonstrates ability to identify minor defects with checklist and service them in accordance with company rules and regulations 1.3 Demonstrates ability to identify major defects with checklist and report them to appropriate personnel 1.4 Demonstrates ability to identify OS parts/standards from manufacturer's reference books/manuals 1.5 Demonstrates understanding of recommended fluid and lubricants 1.6 Demonstrates ability to use basic hand tools and equipment 1.7 Demonstrates ability to accomplished and submit daily checklist forms and reports
2. Underpinning (related) knowledge and attitude	2.1 Company rules and regulations 2.2 Basic unit specifications (BUS) 2.3 Safety (PPE, machine and environmental) 2.4 Controls and gauges 2.6 Components, systems and functions 2.7 Comprehension of operation and maintenance manual 2.8 Fluids and lubricants 2.8 Uses of basic hand tools and equipment
3. Underpinning skills	3.1 Using personal protective equipment (PPE) 3.2 Accomplishing daily checklist forms 3.3 Performing basic preventive maintenance 3.4 Using basic hand tools and equipment 3.4 Reporting minor and major defects
4. Resource implications	Things necessary for the conduct of assessment 4.1 Access to lifting equipment specifications and manuals 4.2 Access to lifting equipment 4.3 Basic hand tools and equipment 4.4 Fluids and lubricants 4.5 PPE 4.6 Safety signages/barricades

5. Method of assessment	Competency must be assessed through 5.1 Written and/or oral questioning 5.2 Observation of practical demonstration 5.3 Work record and documents
6. Context for assessment	6.1 Competency shall be assessed in a normal or simulated workplace environment and in accordance with safe work procedures 6.2 Competency shall be assessed while work is being undertaken independently

UNIT OF COMPETENCY:	**PERFORM PRODUCTIVE OPERATION FOR CRAWLER CRANE**
UNIT CODE:	**CON833313**
UNIT DESCRIPTOR:	This unit covers the knowledge, skills and attitudes in performing equipment standard operating procedures for a Crawler Crane.

ELEMENT	PERFORMANCE CRITERIA ***Bold and Italicized*** *terms are elaborated in the Range of Variables*
1. Load/unload crane to low-bed trailer	1.1 Appropriate and suitable low-bed trailer for transporting the Crane is considered according to job requirements. 1.2 Proper boom position is observed during loading/unloading in accordance with safe operating procedures. 1.3 Crane is loaded/unloaded in correct position using appropriate ramp. 1.4 Assistance from a ***signalman*** is required during loading/unloading of the crane. 1.5 Before and after loading, all safety locks and control levers are secured at neutral position. 1.6 Track pads are secured with stopper blocks. 1.7 Body frame is secured with appropriate binders. 1.8 ***Unexpected situations*** are responded in line with company rules and regulations in a manner that minimizes risk to personnel and equipment.
2. Travel the crane	2.1 Work area is surveyed for safe accessibility or ***potential hazards*** in accordance with safe operating procedures. 2.2 Lattice base boom is secured in place during travel. 2.3 Aid of a signalman is required when necessary. 2.4 Traveling speed is observed in accordance with the site regulations. 2.5 Unexpected situations are responded to in line with company rules and regulations.

3. Position the crane	3.1 Crane is positioned in accordance with ***safety procedures and requirements***
4. Read and interpret load chart	4.1 ***Weight*** of the load is determined according to ***proper information***. 4.2 Lifting capacity is determined according to working radius and boom length. 4.3 ***Rigging gears*** are determined according to lifting plan. 4.4 Weight of any attachment such as main and auxiliary hook blocks, fly jib are considered as part of the load. 4.5 ***Lifting capacity*** in the load chart is followed according to manufacturer's specifications and equipment conditions. 4.6 Doubt about the lifting capacity of the crane based on load chart reading is reported to immediate supervisor.
5. Perform lifting and transferring of load	5.1 Optimum engine speed and allowable working radius during hoisting or swing operation are controlled based on standard operating procedures. 5.2 Communication with Rigger is established and maintained during lifting and transferring of loads. 5.3 ***Safe work procedures and practices*** are observed during ***lifting and transferring operation*** 5.4 Unexpected situations are responded to in line with company rules and regulations.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Signalman	1.1 Spotter 1.2 Helper
2. Unexpected situations	May include but are not limited to: 2.1 Sudden engine breakdown 2.2 Busted hydraulic hose and oil leakages 2.3 Broken wire rope 2.4 Sudden failure of drum brake/clutch (main and auxiliary) 2.5 Sudden malfunction of control levers 2.6 Sudden structural failure of the boom 2.7 Sudden derail of track link assembly 2.8 Sudden tipping 2.9 Sudden ground failure 2.10 Hitting high tension wire 2.11 Force majeure e.g., earthquake, fire, tornado 2.12 Operator fatigue or sickness/condition 2.13 Accidents/incidents
3. Potential hazards	3.1 Other equipment 3.2 Building 3.3 Deep excavation 3.4 Sloping ground 3.5 Uneven terrain 3.6 Overhead “live” electrical wires 3.7 Underground utilities 3.8 Unstable ground

4. Safety procedures and requirements	4.1 ***Crane boom and accessories*** are assembled according to job requirements. 4.2 Assembled components and accessories are tested according to equipment performance criteria. 4.3 ***Lifting Plan*** is thoroughly checked in accordance with job requirements 4.4 Load chart is read/interpreted in accordance with lifting configuration. 4.5 Work area is barricaded with appropriate informative warning signages. 4.6 Crane is positioned on a level and stable working ground in accordance with safe lifting requirements. 4.7 Appropriate ***crane mats*** are properly in place accordance with safety requirements. 4.8 Usable headroom for proper sling selection is determined to ensure safe operation. 4.9 Appropriate number of partline is reeved to ensure safe working load. 4.10 Trial lift without load is performed to ensure safe lifting operation. 4.11 Communicated with rigger to ensure load is secured with appropriate rigging gears 4.12 Risk control procedure is implemented in case of ***adverse environmental conditions***. 4.13 Unexpected situations are responded in line with company rules and regulations.
4.1 Crane boom and accessories	4.1.1 Gantry 4.1.2 Counter weights 4.1.3 Insert boom segment 4.1.4 Top boom 4.1.5 Jib (if necessary) 4.1.6 Pendant cables 4.1.7 Main and auxiliary cable 4.1.8 Pulley block 4.1.9 Auxiliary block 4.1.10 Boom pin/cotter pin 4.1.11 Base boom
4.2 Lifting plan	4.2.1 Set-up 4.2.2 Load information 4.2.3 Crane configuration/specification

4.3 Crane mats	4.3.1 Steel plates 4.3.2 Hardwood 4.3.3 Concrete blocks
4.4 Adverse environmen-tal conditions	4.4.1 Fog 4.4.2 Darkness 4.4.3 High-tension wires 4.4.4 Restricted areas 4.4.5 Heavy rains 4.4.6 Wind aloft (exceeding wind velocity of 20 mph) 4.4.7 Unstable ground condition 4.4.8 Congested areas
5. Weight	5.1 Gross capacity 5.2 Net capacity
6. Proper information	6.1 Bill of ladings 6.2 Packing and shipping list 6.3 Manufacturer's load specifications
7. Rigging gears	7.1 Types and classifications 7.2 Weight 7.3 Proper hitching or application
8. Lifting capacity	8.1 Obsolescence (expected life span) 8.2 Equipment history 8.3 Machine performance 8.4 Wear and tear 8.5 Structural reliability vs. tipping stability
9. Safe work procedures	9.1 Lifting/Rigging gears are checked in accordance with job requirements. 9.2 All slings, ties and hooks are placed and secured correctly before raising the load. 9.3 Load striking the ground, machine or any other object is prevented. 9.4 The boom is prevented from striking any obstruction. 9.5 Shock/Dynamic loading is avoided. 9.6 Load handling is observed.

10. Lifting and transferring operation	10.1 Release house lock 10.2 Release swing lock 10.3 Monitor safety devices 10.4 Hoist the load 10.5 Swing the load 10.6 Raise and lower the boom

EVIDENCE GUIDE

1. Critical aspects of evidence to be considered	Assessment requires evidence that the candidate: 1.1 Demonstrates ability to operate Crawler Crane in accordance with established operating procedure 1.2 Demonstrates ability to carry-out safe work practices 1.3 Demonstrates ability to interpret Load Chart, Lifting/Rigging plan 1.4 Demonstrates ability to communicate with Rigger during crane operation 1.5 Demonstrates ability to follow procedures in lifting and transporting loads. 1.6 Demonstrates knowledge of basic calculation and mensuration 1.7 Demonstrates ability to carry-out safe travel operation
2. Underpinning (related) knowledge and attitude	2.1 Safe operating procedures and practices 2.2 Statutory safety rules and regulations 2.3 Comprehension of load charts 2.4 Comprehension of Lifting/Rigging Plans/site plan and layout 2.5 Company/in-house policies and procedures 2.6 Familiarity with type and center of gravity/weight of loads 2.7 Familiarity with rigging gears and its applications 2.8 Familiarity with rigging signals (ISO standard) 2.9 Basic calculations and mensuration 2.10 Familiarity with safe procedures in assembling and dismantling lattice boom 2.11 Familiarity with DOLE/BWC, D.O. 13, series 1998.
3. Underpinning skills	3.1 Accomplishing crane checklist and reports 3.2 Reporting crane component failure 3.3 Performing actual operation procedure of crane 3.4 Performing safety procedures and practices 3.5 Determining weight and center of gravity 3.6 Following load chart applications 3.7 Using/Following correct rigging signals (ISO standard) 3.8 Calculation and mensuration skills
4. Resource implications	Things necessary for the conduct of assessment 4.1 Access to Crawler Crane and job site/terrain 4.2 Available loads 4.3 Barricades and informative signages 4.4 Rigging gears

5. Method of assessment	Competency in this unit must be assessed through 5.1 Written/Oral questioning 5.2 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 - CRAWLER CRANE
NC Level:

BASIC COMPETENCIES
Nominal Training Hours: 18 Hours (Basic) + 18 Hours (Common)
Course Description:

This course is designed to equip individual with the basic, common and core competencies in Construction Sector particularly in Heavy Equipment Operation.

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	• 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	• Demonstration • Observation • Interviews/ questioning

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	• 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	• 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	• 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	• 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	• 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	• Direct observation • Oral questioning • Written test or examination • Third party report • Demonstration (able to impart knowledge and skills)

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	• Direct observation of application of tasks • Oral questioning • Written test or 1. examination • Third party report • Demonstration

CORE COMPETENCIES

Course Title : HEAVY EQUIPMENT OPERATION Level: CRAWLER CRANE

Nominal Training Hours: 120 Hours

Course Description:

This course is designed to enhance the knowledge, desirable attitudes and skills in the use of crawler crane in accordance with industry standards. It covers core competencies such as: perform pre- and post operation procedure, perform productive operation, and perform basic preventive maintenance servicing on a given crawler 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 procedure for Crawler Crane	2.1 Identify crawler crane components / parts 2.2 Perform visual check of equipment 2.3 Check BLOWAF of crawler crane 2.3.1 Battery 2.3.2 Light 2.3.3 Oil 2.3.4 Water 2.3.5 Air 2.3.6 Fuel 2.4 Check crawler crane system's operation 2.5 Check safety devices accessories 2.6 Perform post operation check	Lecture Practical / Demonstration	• Observation / Demonstration and interview • Written test

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
2. Perform productive operation for Crawler Crane	2.1 Apply safe work practices 2.2 Identify different crane signals 2.3 Load and unload crawler crane to and from trailer bed 2.4 Travel crawler crane 2.5 Position the crane 2.6 Apply interpreted crawler cranes load to load chart 2.7 Perform crawler crane lifting and transferring of load	Lecture Practical / Demonstration	• Observation / Demonstration and interview • Written test
3. Perform basic preventive maintenance servicing for Crawler Crane	3.1 Perform safety practices, and housekeeping 3.2 Perform preventive maintenance and servicing	Lecture Practical / demonstration	• 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 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 crawler crane.

TOOLS		EQUIPMENT		MATERIALS	
QTY		**QTY**		**QTY**	
1 set	• Wrenches (box and open-end 8-24 mm-metric & 7/16 –1" - English)	1 unit	• Crawler Crane(MOA / rental)	5 kls	• Multi- purpose grease
1 set	• Hammer ballpeen (3-4 lbs)	1 unit	• Low bed trailer with tractor head & operator (MOA/rental)	4 liters	• Engine oil (SAE 15w40)
1 set	• Pliers(mechanical 10 ")	1 unit	• Vacuum cleaner	20 liters	• Hydraulic / steering fluid (TELLUS 68/10W)
1 pc	• Adjustable wrench (18 ")	1 unit	• Portable electric air compressor	10 liters	• Final drive/ differential (gear oil GP90/ 140)
1 pc	• Grease gun			10 liters	• Trans-mission oil (ATF)
1set	• Screw driver (10 " flat & Philips)			4 liters	• Water coolant
1 pc	• Putty knife			200 liters	• Diesel fuel
1 pc	• Pry bar (heavy duty)			5 liters	• Battery distilled water
				1 set	• Primary & secondary air filter
				1 pair	• Working clothes
				10 pairs	• Safety shoes
				10 pairs	• Gloves
				10 pcs	• Goggles
				10	• Dust Mask

TOOLS		EQUIPMENT		MATERIALS	
QTY		**QTY**		**QTY**	
				pcs	
				10 pcs	• Hard hat
				2 units	• Test weights - 3 tons - 10 tons
				1 pc	• Crawler crane miniture
				1 pc	• Operator's manual with load chart

3.5 TRAINING FACILITIES

2. The crawler 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 (CRAWLER CRANE)

TRAINER QUALIFICATION (TQ II)

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

* 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 (Crawler Crane) NC II, the candidate must demonstrate competence in all the units of competency listed in Section 1. The successful candidate shall be awarded a National Certificate signed by the TESDA Director General.

4.2 The qualification of **HEAVY EQUIPMENT OPERATION (Crawler Crane) NC II** may be attained through demonstration of competence in a project-type assessment covering the following core units. Candidates may apply for assessment in any accredited assessment center.

4.2.1 **Crawler Crane operation**

- Perform pre- and post-operation for lifting equipment
- Perform productive operation for crawler crane
- Perform basic preventive maintenance servicing for lifting equipment

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.

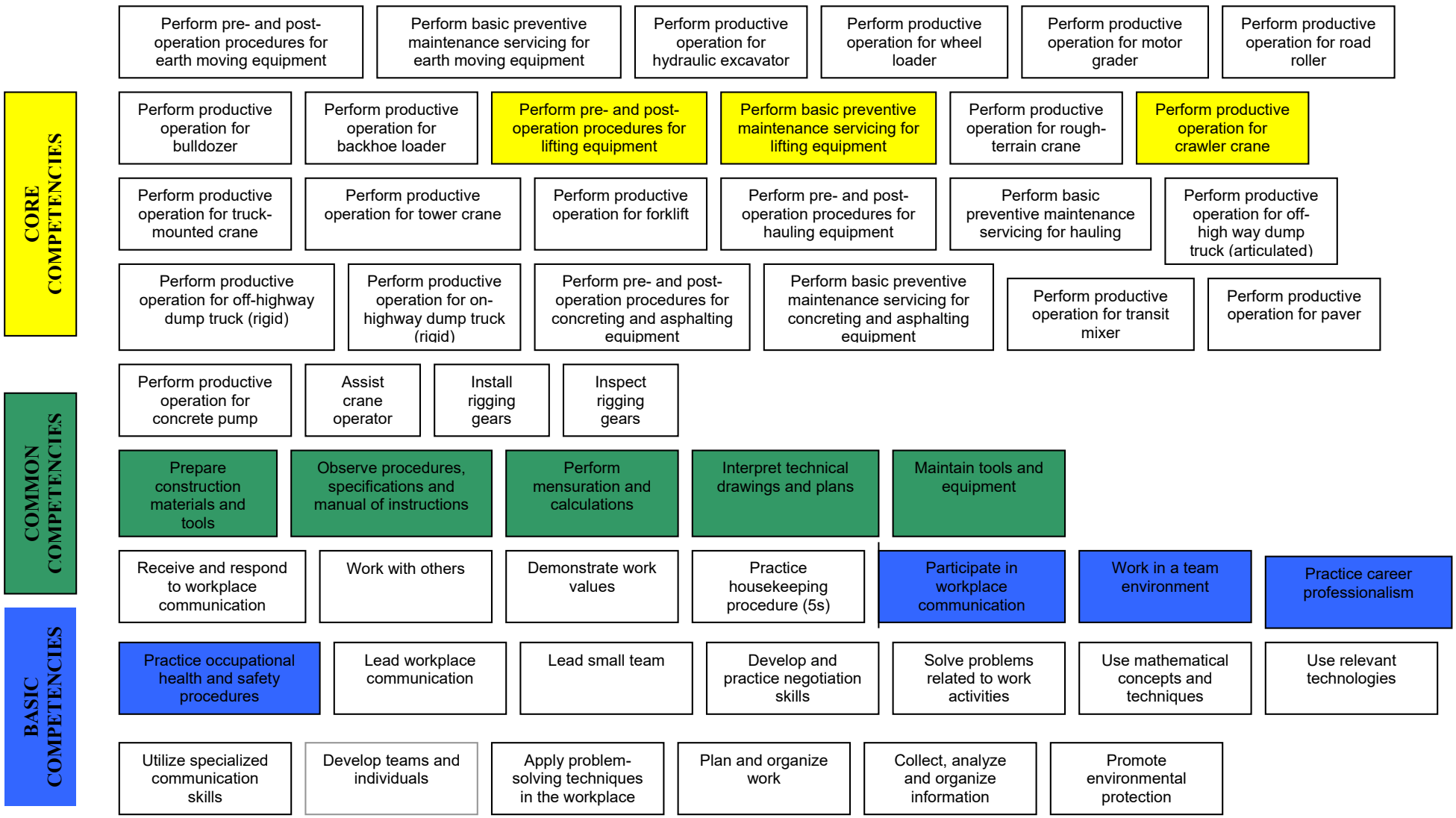
4.4 The following are qualified to apply for assessment and certification:

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)

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 these Competency Standards, the words

1. Attachment	Refers to anything like clampshell, dragline, boring/rotary (drilling) equipment, pile driver, drop hammer or other accessories/special attachments used instead of the conventional lift block to perform different types of lifting jobs.
2. Boom (crane)	Refers to lattice type of boom or jib used for supporting the hoisting tackle.
3. Boom Length	Refers to the measurement from the boom foot pins to the center of the boom point sheaves.
4. Lattice Boom	Refers to a movable mechanical part of the crane carrying the hoisting gear; it is made up of a network of crisscrossed strips of metal
5. Reeving	Refers to a rope system in which the rope travels around the drums and sheaves.
7. Crawler Crane	Refers to a mobile type of crane consists of rotating superstructure with power plant operating machinery, and lattice boom mounted on a base, equipped with thread (track assembly) for travel. In addition to its primary use for lifting services, it is designed also for duty cycle operations such as dragline, clampshell and magnet operations. It is normally controlled by a system of brakes, clutches, and torque converters. This equipment is classified based on 75 percent of its tipping capacity.
7. Standard	Refers to a degree or level of requirement set by the manufacturer.
8. Stability	Refers to the machine resistance to overturning (Truck Mounted Crane - lifting on outriggers are based on 85 percent of the tipping capacity).
9. Safety Devices	Refer to boom angle indicators, load moment indicators, anti-two blocking devices (where applicable), boom kick out lever, etc.
10. Work Area	Refers to any place inside the swing circle of the crane. It must be barricaded off and only those directly involve in the lift shall be allowed to entry.

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