



## **National Vocational Certificate Level 4 in Crush Plant Technology**

### **(Crushing Plant Technician/Supervisor)**



### **Competency Standards**

**National Vocational and Technical Training Commission (NAVTTTC),  
Government of Pakistan**



**National Competency Standards**  
**For**  
**National Vocational Certificate Level 4 in Crush**  
**Plant Technology**  
**(Crushing Plant Technician/Supervisor)**

**NVQF Level 4**

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## INTRODUCTION

Mining and construction Industry are the booming industries of Pakistan and Middle East. There is an increasing demand of the jobs related to Crushing Plant. Therefore, the skills are required to be inducted in the future generation. If an individual is planning to pursue a career in crushing plant, this program will be helpful in targeting various projects in Pakistan and other countries etc.

Keeping in view of the above the competency based national vocational qualifications have been developed by NAVTTC to train the unskilled human resource on the technical and entrepreneurial skills to be employed / self-employed and inevitably set sustainable impact on their lives by increase in their livelihood income.

Training Course is based on competency standards which are defined by the industry and the traditional role of a trainer changes and shifts towards the facilitation of training. A trainer encourages and assists trainees to learn for themselves. Trainees are likely to work in groups (pairs) and all doing something different. Some are doing practical tasks in the workshop, some writing, some not even in the classroom or workshop but in another part of the building using specialist equipment, working on computers doing research on the Internet or the library. As trainees learn at different pace they might well be at different stages in their learning, thus learning must be tailored to suit individual needs. The following facilitation methods (teaching strategies) are generally employed

## PURPOSE OF THE QUALIFICATION

The purpose of the training is to provide skilled manpower to improve the existing mining industry. This will improve the quality in mining sector and the availability of skilled professionals will bring socio-economic benefits to all stakeholders. The specific objectives of developing these qualifications are as under:

- Improve the professional competence of crushing
- Capacitate the local community and trainers in modern CBT training, methodologies and processes as envisaged under NVQF



- Provide flexible pathways and progressions in the mining and construction sectors
- Enable the trainees to perform their duties in efficient manner
- Establish a standardized and sustainable system of training for crushing plant technology in Pakistan

## DATE OF VALIDATION

This national vocational qualification (NVQ) has been validated by the Qualifications Development Committee (QDC) in 4<sup>th</sup> Oct to 8<sup>th</sup> Oct 2021 and will remain in currency until 10<sup>th</sup> October 2031.

\*Shall be reviewed after 3 years

## CODE OF QUALIFICATION

Qualification Title	Code
National Vocational Certificate Level 4 in Crush Plant Technology “Crushing Plant Technician/Supervisor”	724CO010

## ENTRY REQUIREMENTS

- For National Vocational Certificate Level-4 in “Crushing Plant Technician/Supervisor”, the entry requirement is award of National Vocational Certificate Level-3 in “Crush Plant Operator”. The entry in informal sector is not prescribed.



## QUALIFICATIONS DEVELOPMENT COMMITTEE

The following members participated in the qualification development of these qualifications:

Sr. No.	Name	Designation	Organization
1.	Saima Asghar	DACUM Facilitator	CBT Expert/Certified Assessor
2.	Mohammad Ishaq	Coordinator	Deputy Director NAVTTC, Islamabad
3.	Engr.Azhar Iqbal Shad	Principal	GCT , Raiwand road Lahore
4.	Engr.Nadeem Zaghim	Senior Instructor Civil	GCT ,Raiwand road Lahore
5.	Sikandar Hayat	Instructor	GCT ,Raiwand road Lahore
6.	Engr.Imran Murtaza	Lab Engineer Civil	University of South Asia, Lahore
7.	Engr.Hassan Ali	Site Engineer(Civil)	Punjab Engineering Construction Service Lahore
8.	Atif Waheed	Senior Instructor	NLC Dina
9.	Engr.Muhammad Asad Saleem	Project Engineer	Habib Construction Services, Lahore
10.	Engr.Amina Irfan	Lecturer	The University of Lahore
11.	Engr.Umer Farooq	Instructor	GSPCT Gujrat
12.	Engr.Haroon Ejaz	Site Engineer	DHA Multan
13.	Mr.Hassan Raza	Instructor	CTTI Islambad
14.	Engr.Mehr Ali Qurashi	Senior Service Manager	Jaffar Brother Islambad
15.	Engr.Taimoor Iftikhar	Site Supervisor	Hadi Construction KPK



## VALIDATION COMMITTEE

The following members participated in the qualification development of these qualifications:

Sr. No.	Name	Designation	Organization
1.	Saima Asghar	DACUM Facilitator	CBT Expert/Certified Assessor
2.	Mohammad Ishaq	Coordinator	Deputy Director NAVTTC, Islamabad
3.	Engr.Azhar Iqbal Shad	Principal	GCT , Raiwand road Lahore
4.	Muhammad Abdul Moez	Structural Engineer	Rizwan Mirza Consulting Engineer, Lahore
5.	Mr. Atif Waheed	Instructor	CMT,NLC Dina
6.	Mr. Sikandar Hayat	Instructor	GCT ,Raiwand road Lahore
7.	Mr. Ahsan Shahbaz	Manager HSE	Pak Safety Solution, Lahore
8.	Mr. Abdul Samad	Construction Contractor (CBT Assessor)	Faisalabad
9.	Engr.Haroon Ejaz	Site Engineer	DHA Multan
10.	Mr. Munawar Husain	Secretary	PBT Lahore
11.	Mr. Khalid Mahmood	Ex-Principal	GATC Sialkot, Mechanical Power Lahore
12.	Syed Mansoor Ahmed	Assistant IT Manager, NVQF Registry Incharge	SBTE Sindh
13.	Mr. Israr Ahmad	Secretary ,BTE	KPK
14.	Engr.Liaqat Ali Jamhroo	Director, Academics	STEVT
15.	MS. Sumbal Ayaz	Curriculum Expert	British Council Lahore



## SUMMARY OF COMPETENCY STANDARDS

Code	Competency Standards	Level	Theory		Practical		Total	
			C	Hr.	C	Hr.	C	Hr.
1.	Establish and Maintain the Occupational Health and Safety System	4	2	20	3	30	5	50
2.	Perform Advance Communication	4	2	20	3	30	5	50
3.	Perform Basic Machining Operations	4	3	30	15	150	18	180
4.	Disassemble and Assemble Diesel Engine	4	3.3	32	13.8	138	17	170
5.	Perform Periodic Maintenance of Hauling Machines	4	3.3	33	11.7	117	15	150
6.	Troubleshooting of Crushing Plant	4	1.8	18	13.2	132	15	150
7.	Perform Basic Electrical Installations	4	3	30	12	120	15	150
8.	Maintain the Power Generator	4	3	30	9	90	12	120
9.	Maintain Hydraulic System	4	1.8	18	13.2	132	15	150
10.	Perform Basic Green Skills for Crushing Plant	4	0.9	9	2.1	21	3	30
Total			24	240	96	960	120	1200





## 724CO010-A Competency Standard: Establish and Maintain the Occupational Health and Safety System

**Overview:** This unit covers how to establish, maintain and evaluate an occupational health and safety system in the work environment. This unit applies to workers who have either a legislated or delegated responsibility to implement OHS systems to meet the organization's policy requirements. These roles require significant role or delegated authority to allow effective implementation and review. While designed for public safety workers, this unit could be applied in a range of industries.

Competency Units	Performance Criteria
<b>CU1.</b> Carryout Risk assessment at workplace	<b><i>You must be able to:</i></b>  <b>P1.</b> Identify potential hazards at workplace <b>P2.</b> Evaluate the risk <b>P3.</b> Take corrective/preventive action to mitigate the risk <b>P4.</b> Record your findings <b>P5.</b> Review the risk assessment
<b>CU2.</b> Follow emergency response protocol/procedure	<b><i>You must be able to:</i></b>  <b>P1.</b> Identify emergency exits at workplace <b>P2.</b> Select suitable positions for the <b>P3.</b> Identify assembly area at workplace <b>P4.</b> Follow procedure and instructions to evacuate the building <b>P5.</b> Report immediately at designated assembly area in case of emergency
<b>CU3.</b> Perform safe storage and disposal of waste	<b><i>You must be able to:</i></b>  <b>P1.</b> Identify different types of waste material <b>P2.</b> Identify types of containers to store the different types of waste material <b>P3.</b> Use required labels on storage containers <b>P4.</b> Store the waste materials according to standards



	<p><b>P5.</b> Identify types of waste bins</p> <p><b>P6.</b> Dispose- off waste material according to the safety procedure</p>
<p><b>CU4.</b> Maintain ergonomics condition at workplace</p>	<p><b><i>You must be able to:</i></b></p> <p><b>P1.</b> Follow standard working posture/position at workplace</p> <p><b>P2.</b> Follow standard procedure to provide sufficient light at workplace</p> <p><b>P3.</b> Use ergonomic workstations to avoid muscle fatigue</p>

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Risk assessment at workplace
- Hazard identification
- Ergonomic working condition
- Hierarchy of control (the preferred order of risk control measures from most to least preferred that is:
  - Elimination
  - Substitution
  - Engineering control
  - Administrative controls
  - And personal protective equipment)
- Types of emergencies at workplace
- Storage and disposal of hazardous material
- Emergency protocol/procedure for fire, hazardous chemical spills, major power failure and terrorism activity and nature disasters
- Current Safety principles and practices used at workplace

### Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

- Perform risk assessment and hazard identification at the workplace
- Demonstrate safe disposal regarding given hazardous material



## 724CO010-B Competency Standard: Perform Advance Communication

**Overview:** This unit describes the performance outcomes, skills and knowledge required to develop communication skills used professionally. It covers plan and organise work and conduct trainings at workplace, along with demonstrating professional skills independently.

Competency Units	Performance Criteria
<b>CU1.</b> Demonstrate basic communication skills	<b><i>You must be able to:</i></b> <b>P1.</b> Demonstrate different modes of communication: <ul style="list-style-type: none"><li>• Speaking</li><li>• Reading</li><li>• Writing</li><li>• Listening</li></ul> <b>P2.</b> Demonstrate presentation skills through multimedia etc <b>P3.</b> Develop CV according requirements <b>P4.</b> Develop interview skills according to job requirement
<b>CU2.</b> Plan and Organize work	<b><i>You must be able to:</i></b> <b>P1.</b> Identify task requirements. <b>P2.</b> Plan steps to complete tasks <b>P3.</b> Review planning and organizing process <b>P4.</b> Organize work as per task requirement
<b>CU3.</b> Conduct Professional Activities Ethically	<b><i>You must be able to:</i></b> <b>P1.</b> Identify the ethical problems <b>P2.</b> Identify affected parties and their interests <b>P3.</b> Evaluate each solution using the interest those involves

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Training skills
- Professional skills



- Advanced language skills
- Assessment and trainees feedback methods
- Direct and indirect communication methods
- The need of the training type at the work place

### **Critical Evidence(s) Required**

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Develop CV
- Prepare report on plan and organize work



## 724CO010-C Competency Standard: Perform Basic Machining Operations

**Overview:** This unit describes the performance outcomes, skills and knowledge required to perform basic machining operations. It covers grinding and lathe machine operations. It will also allow you to carry out arc welding. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
<b>CU1.</b> Perform Mounting and Dressing of Grinding Wheel on surface Grinding machine	<b>You must be able to:</b>  <b>P1.</b> Select grinding wheel according to material <b>P2.</b> Mount and dress grinding wheel as per standard procedure <b>P3.</b> Shut down machine after completion the task
<b>CU2.</b> Perform single point cutting Tool Grinding on Pedestal Grinder	<b>You must be able to:</b>  <b>P1.</b> Perform tool grinding operation by holding the tool firmly against the rotating wheel by placing it on the tool rest. <b>P2.</b> Dip tool in coolant at intervals to avoid over heating of the job. <b>P3.</b> Adopt technique and methods as per requirements of tool geometry <b>P4.</b> Check quality of tool at suitable intervals <b>P5.</b> Shut down grinder after finishing the work
<b>CU3.</b> Perform Grinding	<b>You must be able to:</b>  <b>P1.</b> Select clamping device according to the job requirement <b>P2.</b> Manage the measuring instruments as per job requirement <b>P3.</b> Switch ON the machine <b>P4.</b> Clamp the work piece as per standard procedure <b>P5.</b> Maintain safe distance between work piece & grinding wheel <b>P6.</b> Apply coolant on grinding surface



	<p><b>P7.</b> Perform grinding as per standard procedure</p> <p><b>P8.</b> Clean &amp; de burr the work piece</p> <p><b>P9.</b> Verify dimensional and geometrical accuracy at suitable intervals</p> <p><b>P10.</b> Shut down the machine in safe position after finishing the work</p>
<b>CU4.</b> Set Lathe machine for operation	<p><b>You must be able to:</b></p> <p><b>P1.</b> Check oil levels</p> <p><b>P2.</b> Switch ON the machine</p> <p><b>P3.</b> Run machine warm-up cycle</p> <p><b>P4.</b> Select tool &amp; clamping device according to the job requirement.</p> <p><b>P5.</b> Manage the measuring instruments as per job requirement.</p>
<b>CU5.</b> Perform Facing	<p><b>You must be able to:</b></p> <p><b>P1.</b> Clamp and centre the work piece as per SOPs</p> <p><b>P2.</b> Clamp the tool in tool post &amp; set in required angle</p> <p><b>P3.</b> Set machine parameter as per job specifications</p> <p><b>P4.</b> Perform Facing operation by initial touching and adjust the depth of cut as per SOPs.</p> <p><b>P5.</b> Check quality of the component at suitable intervals</p> <p><b>P6.</b> Shut down the machine at safe position after finishing the work</p>
<b>CU6.</b> Perform Turning	<p><b>You must be able to:</b></p> <p><b>P1.</b> Clamp and centre the work piece as per SOPs</p> <p><b>P2.</b> Clamp the tool in tool post &amp; set in required angle</p> <p><b>P3.</b> Set machine parameter as per job specifications</p> <p><b>P4.</b> Perform turning operation by initial touching and adjust the depth of cut as per SOPs.</p> <p><b>P5.</b> Check quality of the component at suitable intervals</p> <p><b>P6.</b> Shut down the machine at safe position after finishing the work</p>
<b>CU7.</b> Perform Drilling/Boring	<p><b>You must be able to:</b></p> <p><b>P1.</b> Clamp and centre work piece as per SOPs</p> <p><b>P2.</b> Fit the drill bit in tail stock</p> <p><b>P3.</b> Set machine parameter as per job specifications.</p> <p><b>P4.</b> Perform drilling to produce appropriate hole size for boring as per SOPs.</p> <p><b>P5.</b> Clamp the boring tool in the tool post.</p>



	<p><b>P6.</b> Carry out Boring operation as per standard procedure</p> <p><b>P7.</b> Check quality of the job at suitable intervals</p> <p><b>P8.</b> Shut down the machine at safe position after finishing the work.</p>
<b>CU8.</b> Perform Arc Welding	<p><b>You must be able to:</b></p> <p><b>P1.</b> Adjust welding parameters (current, voltage etc.) of welding plant</p> <p><b>P2.</b> Maintain gap between electrode and base metal as per standard practices</p> <p><b>P3.</b> Deposit root pass as per welding procedure specifications/job requirements</p> <p><b>P4.</b> Deposit filling passes as per welding procedure specifications/job requirements</p> <p><b>P5.</b> Deposit capping pass as per welding procedure specifications/job requirements</p> <p><b>P6.</b> Remove slag after every pass with chipping hammer</p> <p><b>P7.</b> Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p><b>P8.</b> Clean work area in accordance with workplace safety practices</p> <p><b>P9.</b> Maintain and store tools/equipment/consumable materials in accordance with organization guidelines</p>

## Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Job drawings
- Types and uses of measuring instruments
- Types of surface grinding machines
- Grinding Machine Operations
- Specification of grinding wheels & their application
- Dressing procedure of grinding wheel
- Defects of grinding wheel
- Coolant & procedure of application
- Types of lathe machines & their applications
- Construction and working of lathe machine
- Different types of attachment used in lathe machines
- Clamping devices & procedures



- Setting machine parameters
- Types of drilling /boring
- Types of turning
- Inspection tools & techniques
- Types of work piece material & cutting tool
- Sequence of operations to achieve the job requirements
- Tool types and tool geometry
- Welding positions
- Types of passes
- Specifications/ classification of electrode/s required for the job
- Electrical parameters like (voltage, current etc.) and their effects on welding
- Welding techniques as per WPS/instruction sheet
- Welding procedure specifications (WPS)
- Types of joints
- Polarity setting according to standard specifications
- Visual welding defects
- Welding codes and standards
- Sheet metal gauge

### **Critical Evidence(s) Required**

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform Arc Welding on given job
- Perform Single point tool grinding
- Perform grinding
- Perform Facing, Turning, drilling & boring in a metal work piece according to given drawing





## 724CO010-D Competency Standard: Disassemble and Assemble Diesel Engine

**Overview: Overview:** This unit describes the performance outcomes, skills and knowledge required to disassemble and assemble diesel engine. It covers disassembling the engine block, engine head and assembling the engine block, engine head. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
<b>CU1.</b> Disassemble Engine Head	<b><i>You must be able to:</i></b>  <b>P1.</b> Select tools <b>P2.</b> Remove valve cover ,intake and exhaust manifolds <b>P3.</b> Remove rocker arm from cylinder head <b>P4.</b> Remove cylinder head bolts <b>P5.</b> Remove valve lifter <b>P6.</b> Remove timing cover <b>P7.</b> Remove camshaft drive <b>P8.</b> Remove Head Gasket <b>P9.</b> Fill inspection check list
<b>CU2.</b> Disassemble Engine Block	<b><i>You must be able to:</i></b>  <b>P1.</b> Select tools <b>P2.</b> Disassemble the Piston and connecting rod <b>P3.</b> Disassemble the engine block according to engine manual <b>P4.</b> Fill inspection check list
<b>CU3.</b> Assemble Engine block	<b><i>You must be able to:</i></b>  <b>P1.</b> Select tools and engine manufacturing manual <b>P2.</b> Assemble the Ring and Piston and connecting rod <b>P3.</b> Assemble the engine block according to engine manual <b>P4.</b> Fill inspection check list.



<b>CU4.</b> Assemble Engine Head	<b>You must be able to:</b>  <b>P1.</b> Select tools <b>P2.</b> Install head gasket <b>P3.</b> Assemble camshaft drive <b>P4.</b> Assemble timing cover <b>P5.</b> Assemble valve lifter <b>P6.</b> Assemble cylinder head bolts <b>P7.</b> Assemble rocker arm in cylinder head <b>P8.</b> Assemble valve cover, intake and exhaust manifolds
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### Knowledge & Understanding:

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Engine terms
- Engine components and its functions
- Engine lubrication system
- Engine compression ignition system
- Engine cooling system
- Engine fuel system
- Engine troubleshooting

### Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Disassemble and Assemble the engine components
- Adjust engine timing and ignition timing
- Service air filter ,cooling system and fuel injectors



## 724CO010-E Competency Standard: Perform Periodic Maintenance of Hauling Machines

**Overview:** This unit describes the performance outcomes, skills and knowledge required to perform periodic maintenance of hauling machine. It covers service of hauling machines. It will also allow you to service operator cab and supporting pneumatic (Air-filled) system. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
<b>CU1.</b> Service Hydraulic System	<b><i>You must be able to:</i></b>  <b>P1.</b> Select tools <b>P2.</b> Identify leakages and noise of the hydraulic system <b>P3.</b> Check hydraulic oil levels <b>P4.</b> Replace hoses/pipes
<b>CU2.</b> Service Suspension System(Hauling)	<b><i>You must be able to:</i></b>  <b>P1.</b> Select tools <b>P2.</b> Check gashes or bulges and tires <b>P3.</b> lubricate bearings, bush and pins <b>P4.</b> Change damaged grease fittings
<b>CU3.</b> Service Drive Train (Hauling)	<b><i>You must be able to:</i></b>  <b>P1.</b> Select tools <b>P2.</b> Check wear, leaks and damage to components <b>P3.</b> Identify defective undercarriage components <b>P4.</b> Repair / replace defective undercarriage components
<b>CU4.</b> Service Braking System (Hauling)	<b><i>You must be able to:</i></b>  <b>P1.</b> Select tools <b>P2.</b> Top-up brake fluid reservoir <b>P3.</b> Identify defective components of braking system <b>P4.</b> Repair /replace defective components of braking system
<b>CU5.</b> Service the Cab	<b><i>You must be able to:</i></b>  <b>P1.</b> Identify missing or defective components or controls <b>P2.</b> Clean front/rear wind screen, windows and mirrors



	<b>P3.</b> Adjust mirrors <b>P4.</b> Replace broken mirror/frame <b>P5.</b> Adjust seat and seat belt <b>P6.</b> Check knobs of all lights and indicators
<b>CU6.</b> Service Supporting Pneumatic (Air-filled) System	<b>You must be able to:</b> <b>P1.</b> Select tools <b>P2.</b> Perform basic maintenance of air compressor, choked drain and valves <b>P3.</b> Check and Replace damage seal, air lines and valves

### Knowledge & Understanding:

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Functions of Mechanical Systems of hauling machines
- Inspection & Maintenance of hauling machines and its associated Attachments.
- Inspection & Maintenance procedure of Mechanical Systems in hauling machines
- Types of hauling machines
- Components of hauling machines
- Dump truck types, characteristics
- Operational, maintenance and basic diagnostic procedures
- Methods of changing machine attachments
- Attachments and their purpose
- Basic tools and supplies.
- Lockout/Tag out procedure (LOTO procedure)
- Machine emergency shut-down procedure.
- Resetting emergency control switch
- Pre-start checks, startup/shutdown procedures.

### Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:



- Service of hydraulic system
- Service suspension system (Hauling)
- Service drive train (Hauling)
- Service braking system (Hauling)
- Service operator Cab
- Service supporting pneumatic (Air-filled) system



## 724CO010-F Competency Standard: Troubleshooting of Crushing Plant

**Overview:** This unit describes the performance outcomes, skills and knowledge required to troubleshooting of plant. It will also allow you to service of different systems of crushing plant. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
<b>CU1.</b> Service of Spring and Cushions of Screen	<b><i>You must be able to:</i></b> <b>P1.</b> Select tools <b>P2.</b> Check and lubricate bearings, bush and pins <b>P3.</b> Check and replace greasing nipples <b>P4.</b> Check and replace spring and cushions <b>P5.</b> Check and replace the screen
<b>CU2.</b> Service of Plant Cabin	<b><i>You must be able to:</i></b> <b>P1.</b> Identify defective components / controls <b>P2.</b> Clean wind screen <b>P3.</b> Clean knobs of all lights and siren <b>P4.</b> Check and replace the damage switches of control panel
<b>CU3.</b> Service Conveyer	<b><i>You must be able to:</i></b> <b>P1.</b> Select tools <b>P2.</b> Check and lubricate bush and pins of rollers <b>P3.</b> Check and adjust the conveyer belt <b>P4.</b> Check and adjust the alignment of motors <b>P5.</b> Inspect the speed sensors with volt meter <b>P6.</b> Replace the damage sensors <b>P7.</b> Check and replace the damage components of conveyer



<b>CU4.</b> Service Hopper and Feeder	<b><i>You must be able to:</i></b>  <b>P1.</b> Select tools <b>P2.</b> Lubricate bush and pins of hopper and feeder <b>P3.</b> Weld the damage parts
<b>CU5.</b> Service Crusher	<b><i>You must be able to:</i></b>  <b>P1.</b> Select tools <b>P2.</b> Inspect the connecting rode and crushing jaws <b>P3.</b> Tight nuts and flange <b>P4.</b> Replace with new bearing <b>P5.</b> Replace with new shaft

### Knowledge & Understanding:

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Functions of Mechanical Systems of crushing plant
- Inspection & Maintenance of crushing plant, and its associated Attachments.
- Inspection & Maintenance procedure of Mechanical Systems in crushing plant
- Types of crush plant
- Types of crushers
- Components of crushers
- Components of conveyor belt
- Types of screen
- Types of Hopper
- Components of control panel
- Components of feeder
- Components of Electrical system
- Types of feeders
- Components of hydraulic system and pneumatic system



- Specifications (shape, types and sizes) of belts
- Replacement techniques of bearings
- Specifications (Number) of bearings and their uses
- Sizes and uses of blades
- Replacement techniques of blades
- Nature of cutting materials
- Alignment /adjustment techniques of motors

### **Critical Evidence(s) Required**

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Change the belt
- Replace the jaw
- Replace faulty bearing
- Replace damage rollers of conveyor belt
- Replace the repaired/new shaft
- Replace spring and cushions





## 724CO010-G Competency Standard: Perform Basic Electrical Installations

**Overview:** This unit describes the performance outcomes, skills and knowledge required to perform basic electrical installations. It covers basic electric circuits, three phase connection, and basic electrical measurements, interpret electrical layout and power supply to machine. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
<b>CU1.</b> Interpret Electrical layout	<b>You must be able to:</b>  <b>P1.</b> Interpret layout of the job for installations <b>P2.</b> Interpret electrical drawing for electrical wirings <b>P3.</b> Connect components of equipment according to drawing
<b>CU2.</b> Perform Basic Electric Circuits	<b>You must be able to:</b>  <b>P1.</b> Prepare series circuit on work bench <b>P2.</b> Prepare parallel circuit on work bench <b>P3.</b> Prepare Head and Tail Light Circuit on work bench <b>P4.</b> Prepare indicator circuit on work bench
<b>CU3.</b> Perform three phase connection	<b>You must be able to:</b>  <b>P1.</b> Select cable gauge <b>P2.</b> Select cables colors <b>P3.</b> Connect cables <b>P4.</b> Insulate Joints
<b>CU4.</b> Perform Basic Electrical Measurements	<b>You must be able to:</b>  <b>P1.</b> Measure voltage <b>P2.</b> Measure current <b>P3.</b> Measure resistance <b>P4.</b> Test continuity



<b>CU5.</b> Provide Power Supply to machine	<b>You must be able to:</b> <b>P1.</b> Select electrical appliances <b>P2.</b> Connect cables with electrical appliances as per operation manual <b>P3.</b> Verify the connections according to color coding / tagging / numbering. <b>P4.</b> Check the connectivity of earthing point.
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### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Electrical symbols to be used in drawings
- AC and DC
- Ohm's Law
- Electrical connection scheme of the job
- Handling techniques for placement for electrical equipment
- Different methods of cable testing
- Methods of installing the electrical appliances
- Different types of coding procedures (e.g. color coding / tagging / numbering)
- Earthing and testing procedures
- Working principle of earth tester
- L.C.R meter

### Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform Basic Electric Circuits



- Perform three phase connection
- Perform Basic Electrical Measurement
- Provide Power Supply to machine



## 724CO010-H Competency Standard: Maintain Power Generator

**Overview:** This unit describes the performance outcomes, skills and knowledge required to maintenance of power generator. It will also allow you to troubleshoot of generator, control panel and preventive maintenance. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
<b>CU1.</b> Perform Preventive Maintenance	<b><i>You must be able to:</i></b>  <b>P1.</b> Perform daily maintenance of Engine <b>P2.</b> Perform periodic maintenance of engine. <b>P3.</b> Perform alternator preventive maintenance
<b>CU2.</b> Troubleshoot of generator	<b><i>You must be able to:</i></b>  <b>P1.</b> Check stator, rotor, exciter, rectifiers <b>P2.</b> Replace rectifier and exciter <b>P3.</b> Check and replace cooling fan <b>P4.</b> Check and replace starting solenoid valve <b>P5.</b> Replace AVR(automatic voltage regulator)
<b>CU3.</b> Troubleshoot of Control Panel	<b><i>You must be able to:</i></b>  <b>P1.</b> Check and replace switches <b>P2.</b> Check and replace wires <b>P3.</b> Check and replace fuses

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Parts of generator
- Parts of alternator
- Components of control panels
- Preventive maintenance of generator
- Preventive maintenance of alternator



- Load test of alternator
- starting solenoid valve

### **Critical Evidence(s) Required**

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Analyze main alternator
- Analyze operation of control panel
- Perform preventive maintenance



## 724CO010-I Competency Standard: Maintain Hydraulic System

**Overview:** This unit describes the performance outcomes, skills and knowledge required to maintain hydraulic system. It covers inspection and replacement of hydraulic pump, motor and control valve. It will also allow you to inspection and overhauling of hydraulic cylinder. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
<b>CU1.</b> Inspect hydraulic pump and control valve	<b><i>You must be able to:</i></b> <b>P1.</b> Check the set-pressure and compare with standard value <b>P2.</b> Measure the flow rate and compare with standard value <b>P3.</b> Inspect and adjust Proportional pressure control (PPC) valve as per requirement
<b>CU2.</b> Replace hydraulic pump and motor	<b><i>You must be able to:</i></b> <b>P1.</b> Remove hydraulic pipes of pump and motor <b>P2.</b> Remove hydraulic pump and motor from hydraulic unit <b>P3.</b> Install hydraulic pump and motor to hydraulic unit <b>P4.</b> Install hydraulic pipes of pump and motor
<b>CU3.</b> Replace hydraulic control valve	<b><i>You must be able to:</i></b> <b>P1.</b> Remove hydraulic pipes of control valve <b>P2.</b> Remove hydraulic control valve <b>P3.</b> Install hydraulic pipes to control valve <b>P4.</b> Install hydraulic valve on hydraulic unit
<b>CU4.</b> Overhaul hydraulic cylinder	<b><i>You must be able to:</i></b> <b>P1.</b> Disassemble the hydraulic cylinder <b>P2.</b> Replace dust seal <b>P3.</b> Replace U-packing <b>P4.</b> Replace V-packing <b>P5.</b> Replace piston “O” rings <b>P6.</b> Assembling of hydraulic cylinder

### Knowledge & Understanding



The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Principle of hydraulic pump.
- Nomenclature of hydraulic pump.
- Different types of hydraulic pump
- Relief recess, floating bush, side bush, radial clearances and pressure balancing groove.
- Effects of discharge pressure, running clearances and viscosity/oil temperature on the pump capacity with the help of graphs
- Describe deterioration of pump due to dirty and foamy oil and cavitations due to aeration
- Types of valves
- Hydraulic cylinder
- Types of hydraulic cylinder
- Components of hydraulic cylinder
- Function and structure of each component of hydraulic cylinder piston ring, wear ring, U-packing, V-packing and dust seal.
- Location, structure and function of quick drop valve used in hydraulic cylinder.
- Pilot pressure to operate the spools also draw circuit diagram.
- Structure, function and operation of Proportional pressure control (PPC) valve.
- Codes on monitor screen.

### **Critical Evidence(s) Required**

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Inspect and replace hydraulic pump and motor
- Inspect and replace hydraulic control valve
- Disassemble and assemble the hydraulic cylinder
- Replace different components of hydraulic cylinder
- Remove and install hydraulic cylinder on hydraulic unit



## 724CO010-JCompetency Standard: Perform Basic Green Skills for Crushing Plant

**Overview:** This unit describes the performance outcomes, skills and knowledge required to perform basic green skills for crushing plant. It will also allow you to manage sustainability of materials used at crush plant and waste at site .Your underpinning knowledge will be sufficient to provide you the basis for your work.

<b>Competency Units</b>	<b>Performance Criteria</b>
<b>CU1.</b> Manage sustainability of materials used at crush plant	<b>You must be able to:</b> <b>P1.</b> Select sustainable raw materials as per requirement <b>P2.</b> Follow standard procedure to manage systems (waste, energy, water) <b>P3.</b> Perform impact quantification of used material at crush plant
<b>CU2.</b> Manage crush plant waste	<b>You must be able to:</b> <b>P1.</b> Identify various types of waste at site <b>P2.</b> Sort and categorize reusable waste <b>P3.</b> Dispose unusable waste as per set standards <b>P4.</b> Place reusable material at designated storage area <b>P5.</b> Transport waste material to designated place

### Knowledge & Understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Environmental degradation
- Types of raw materials at crush plant
- Types of waste
- Waste reduction techniques
- Concept of 6 R approach (Reduce, Reuse, Recycle, Repair, Renew, and Rethink)
- Reusable materials





- Recyclable materials
- Methods for disposal of unusable materials
- Just-in-time (JIT) approach
- Basic knowledge of green energy resources (solar, biogas, natural light, rainwater, wind energy etc.)

### **Critical Evidence(s) Required**

- Fill checklist of incorporating waste/reusable materials, wastage controls, and resources management as per instructions.
- Prepare impact assessment report of material used at crush plant



## COMPLETE LIST OF TOOLS AND EQUIPMENT

Sr. #	Description
1.	Application Software
2.	Ball peen Hammer
3.	Bench vice
4.	Chain Hoist
5.	Chipping Hammer
6.	Chisel
7.	Circlip remover
8.	Circuit Diagrams for Plants
9.	Combination set
10.	Combination spanner set
11.	Computers
12.	Conveyor belt
13.	Conveyors
14.	Crusher
15.	Diagonal cutter
16.	Dial Bore Gauge
17.	Dial indicator gauge
18.	Digital Balance



Sr. #	Description
19.	Drilling machine with accessories
20.	Drilling tools (center drill, counter boring tool , reamer etc)
21.	Ear Plugs
22.	Electric meters
23.	Face mask
24.	Feeder
25.	Feeler gauges
26.	Fire Buckets
27.	Fire Extinguishers
28.	First aid Kit
29.	Grip pliers
30.	Grease gun
31.	Hand vice
32.	Hauling machines with accessories
33.	Hooks / Anchors
34.	Hopper
35.	Hydraulic pump and motor
36.	Handsaw with blade



Sr. #	Description
37.	Internet router
38.	Jackhammer
39.	Lathe machine with accessories
40.	Lathe Tools(Facing, Threading, etc)
41.	L-key sets
42.	Log Books
43.	Manufacturers Operation and Maintenance Manual & Video
44.	Measuring Tape
45.	Micrometer
46.	Multimeter
47.	Nose pliers
48.	Oil Can
49.	Pipe wrench
50.	Piston ring compressing tool
51.	Plant software
52.	Printer
53.	Safety gloves
54.	Safety Apron
55.	Safety Belts



Sr. #	Description
56.	Safety Blankets
57.	Safety goggles
58.	Safety harness
59.	Safety Helmets
60.	Safety net
61.	Safety Shoes
62.	Scanner
63.	Screw driver set
64.	Screw pitch gauges
65.	Set of Adjustable Wrench
66.	Set of Spanners (Open end, Ring)
67.	Shovels with handle
68.	Sieve set
69.	Sign Board of Safety instructions
70.	Simulated version of crushing plant operational software.
71.	Slings
72.	Slip joint plier
73.	Snap Gauge set
74.	Socket set



Sr. #	Description
75.	Socket set
76.	Spatula
77.	Spirit Level
78.	Stationary Items
79.	Steel Rules
80.	Straight peen Hammer
81.	Stretcher
82.	Thread gauges
83.	Tong
84.	Torque wrench
85.	Tri Square
86.	Valve lifter
87.	Various hand / power tools
88.	Vernier Caliper