



National Competency Standards for “Level-3 Senior Technician in Mining Process Technology”



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



ACKNOWLEDGEMENT

National Vocational and Technical Training Commission (NAVTTTC) extends its gratitude and appreciation to representatives of business, industry, academia, government agencies, provincial TEVTAs, sector skill councils and trade associations who spared time and extended their expertise for the development of National Vocational Qualifications for the trade of **Mining Process Technology**. This work would not have been possible without the technical support of the above personnel.

NAVTTTC initiated development of CBT&A based qualifications for 200 traditional / hi-tech trades under the Prime **Minister’s Hunarmand Pakistan Program**, focusing on Development & Standardization of 200 Technical & Vocational Education & Training (TVET) Qualifications. NAVTTTC efforts have received full support from the Ministry of Federal Education and Professional Training, which highly facilitated progress under this initiative.

It may not be out of place to mention here that all the experts of Industry, Academia, VET TEVTAs, BTEs and PVTC work diligently for making this qualification worthy and error free for which all credit goes to them. However, NAVTTTC accepts the responsibility of all the errors and omissions still prevailing in the qualification document.

Development of Skill Standards is a dynamic and ongoing process, and the developed skill standards need periodic review and updating owing to the constant technological advancements, development in scientific knowledge, and growing experience of implementation at the grass root level as well as the demand of industry. NAVTTTC will ensure to keep the qualifications abreast with the changing demands of both national and international job markets.

**Executive Director,
NAVTTTC**



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1. Introduction

Mining technology is extraction of valuable minerals ores like Manganese, tantalum, cassiterite, copper, tin, nickel, bauxite, iron, gold, silver, and diamonds or other geological materials from the surface or under the earth. Usually these ore bodies in the form of lode, vein, seam, reef, or placer deposit. In other words it is industrial activity that removes rock from the Earth's crust and processes it to remove valuable minerals for us to use. This technology in a wider sense also includes extraction of any non-renewable resource such as petroleum, natural gas, or even water.

Primarily, there are two types of mining methods being used for the extraction of minerals and ores; surface/opencast mining and underground mining. The choice of method is largely determined by factors such as depth, geology of the mineral deposit and the cost of equipment. When evaluating mineral deposits, it is extremely important to keep profit in mind. The total quantity of mineral in a given deposit is referred to as the mineral inventory, but only that quantity which can be mined at a profit is termed ore reserves.

The overall sequence of activities in modern mining is often compared with the five stages in the life of a mine: prospecting, exploration, development, exploitation, and reclamation. In the first Prospecting stage; geophysical, geochemical procedures, Location of favourable loci (maps, literature, and old mines), Air source/aerial photography, airborne geophysics, satellite, Surface/ground geophysics, geology and Spot anomaly is evaluated. Exploration (Ore body); Sample (drilling or excavation), assay, testing analysis, Estimation tonnage and grade, Valuate deposit: present value, income cost, Feasibility study: make decision to abandon or develop. Development (Prospect); Acquire mining rights (purchase or lease), File environmental impact statement, technology, assessment, permit, Construct access roads, transport system, Locate surface plant, construct facilities, Excavate deposit (strip or sink shaft). Exploitation (Mine); Factors in choice of methods like geologic, geographic, economic, environmental, societal safety, Types of mining methods. Surface: open pit, open cast, etc. Underground: room and pillar, block caving, etc. Monitor costs and economic payback. Reclamation (Real estate); Removal of plant and buildings. Reclamation of waste and tailings dumps, Monitoring of discharges.

Being cognizant of this fact, National Vocational & Technical Training Commission (NAVTTTC) developed competency standards for Mining and mineral technology training under National Vocational Qualifications Framework (NVQF). These competency standards have been developed by a Qualifications Development Committee (QDC) and validated by the Qualifications Validation Committee (QVC) having representation from the leading development in mining area of the country.



2. Purpose of the Qualification

The competency based NVQ has been developed to train the unskilled men and women of Pakistan on the technical and entrepreneurial skills to be employed / self-employed and inevitably set sustainable impact on their lives by enhancing their livelihood income.

The purpose of these qualifications is to set professional standards for upcoming experts, who will serve as key elements enhancing quality of Pakistan’s manufacturing sector. The specific objectives of developing these qualifications are as under:

- Improve the professional competencies of individual in metallurgy and cast metal technology
- Capacitate the local community and trainers in modern CBT trainings, methodologies and processes as envisaged under NVQF
- Provide flexible pathways and progressions in metallurgy and cast metal technology
- Enable the trainees to perform their duties in efficient manner
- Establish a standardized and sustainable system of training in Pakistan
- Enabling the youth with greater employment opportunities



3. Date of Validation

The level 3 Mining Process Technology qualification has been validated on 04 Oct to 08 Oct, 2021 at PITAC, Lahore, by the qualification validation committee (QVC) members and will remain in currency until 10th October 2031

4. Date of Review

The qualification shall be reviewed after 3 years.

5. Codes of Qualifications

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Qualification Title	Code
National Vocational Certificate Level 3 in Mining Process Technology “ Senior Technician ”	724MP13



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6. Members of Qualification Development Committee

The following members participated in the qualification development process at PITAC, Lahore.

Date: 13 to 17 August 2021

S#	Name	Designation
1.	Dr. ShahidTufail Sheikh	Member Science, Ex-Head of MPRC Lahore
2.	Dr. Farhat Yasmeen	Professor, UET Lahore
3.	Dr. Muhammad Naeem Khan	AP, Govt Science College Wahdat Road, Lahore
4.	Dr. Irfan Hafeez	Senior Scientific Officer, PCSIR Lahore
5.	Dr. Asma Sheikh	Scientific Officer, PCSIR Lahore
6.	Dr. Shafialftikhar	AP, University of Sahiwal
7.	Muhammad Irfan Zubair	Deputy Director GSP, Lahore
8.	Shahbaz Muhammad	Assistant geophysicist GSP, Lahore
9.	Hafiz ZeeshanAkram	Assistant Director GSP, Lahore
10.	Muhammad Shahzad	Director, NAVTTC, Islamabad
11.	Engr. Saba Sadiq	DACUM FACILITATOR, Islamabad



7. Members of Qualification Validation Committee

The following members participated in the qualification development process at PITAC, Lahore. **Date: Oct 4th 2021 to Oct 8th 2021**

S#	Name	Designation
1.	Aftab Hussain	DACUM Facilitator/ Principal P-TEVTA Rawalpindi
2.	Dr. ShahidTufail Sheikh	Member Science, Ex-Head of MPRC Lahore
3.	Dr. Farhat Yasmeen	Professor, UET Lahore
4.	Dr. Muhammad Naeem Khan	AP, Govt Science College Wahdat Road, Lahore
5.	Dr. Irfan Hafeez	Senior Scientific Officer, PCSIR Lahore
6.	Engr. Shafaat Ali	Lecturer (Mining) GCT KharBajaur
7.	Engr. M. MuneeburRehman Khan	Measurement Engineer, ACC PVT Ltd
8.	ZeeshanMusadiq	Data Engineer/Mudlogger (Geologist) Petro Services
9.	Tariq Mehmoob	Incharge Operational Wing PBTE, Lahore
10.	Mr. Tahir Shah	Assistant Secretary TTB Peshawar
11.	Syed Mansoor Ahmed	Assistant Manager IT, NVQF Registry Incharge, SBTE Sindh

8. ENTRY REQUIREMENTS

- For National Vocational Certificate Level-3 in Mining process Technology “Senior Technician”, the entry requirement is Level-2 in Mining process Technology “Junior Assistant” in formal institute. The entry in informal sector is not prescribed.

9. Regulation of the Qualification and schedule of units

Not applicable



National Competency Standards for “Senior Technician in Mining Process Technology”



10. Summary of Competency Standards

Sr.N o	Competency Standards	NVQF Level	Category	Estimated Contact Hr.			Credit Hr.
				Th.	Pr.	Total	
Senior Technician in Mining Process Technology -LEVEL 3							
1	Maintain Safety at Site	3	Generic	17	63	80	8
2	Work in a Team Environment	3	Generic	12	18	30	3
3	Perform Core Drilling for Mining	3	Technical	17	63	80	6
4	Perform Blasting Operation	3	Technical	17	63	80	8
5	Perform Conveyor Operations	3	Technical	6	54	60	6
6	Perform Basic Computer Operations	3	Generic	20	30	50	5
7	Develop 2D drawings	3	Functional	9	71	80	8
8	Develop 3D drawing	3	Functional	9	71	80	8
9	Manage Inventory of mine material	3	Technical	13	47	60	8
Total				120	480	600	60



11.Details of Competency Standards

Level 3 - Senior Technician in Mining Process

724CO09A-Competency Standard: Maintain Safety at Site

Overview: This competency standard covers the skills and knowledge required to maintain safe work condition at site, emergency response activity at crushing plant site. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Maintain safe work condition at site	<i>You must be able to:</i> P1. Recognize the safety signs and symbols P2. Identify potential hazards at work site P3. Identify the risk of slip, trip and fall at work place P4. Perform fall protection measures as per job requirements P5. Label and store chemicals as per Material Safety Data Sheet (MSDS)
CU2. Perform fire fighting	<i>You must be able to:</i> P1. Identify source of fire. P2. Identify classes of fire P3. Raise fire alarms P4. Select suitable fire extinguishers P5. Check expiry of fire extinguisher P6. Check wind direction P7. Locate emergency exits P8. Perform PASS (Pull, aim, squeeze and sweep) on fire extinguisher
CU3. Carry out first aid treatment	<i>You must be able to:</i> P1. Follow COVID-19 SOP's P2. Identify basic elements for first aid kit P3. Maintain a fully stocked first aid kit P4. Check expiry date of medicines P5. Perform mock first aid treatment for minor injuries
CU4. Perform Basic electrical	<i>You must be able to:</i>



work safely at workplace	<p>P1. Check the connectivity of earthing with power equipment</p> <p>P2. Check leads and cable for any visual damage before use</p> <p>P3. Tag damaged lead, cable and connection points and report to the supervisor</p>
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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:

- Unsafe act and unsafe conditions
- Electrical safety
- First Aid treatment
- Source of fire
- Firefighting techniques
- Housekeeping at workplace
- Emergency exits at workplace
- Types of fire extinguisher
- Classes of fire
- Types of hazardous materials and relevant safety procedures
- Use of required PPE for different situations

Critical Evidence(s) Required

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

- Prepare a list of PPEs
- Demonstrate the use of at least one of the PPEs in front of assessor as per assessors directions
- Perform first aid treatment against electric shock/minor injury.
- Explain safety procedure at workplace
- Differentiate between safe and unsafe tools

Tool and Equipment

1. Steel-toed footwear,
2. Hard hat,
3. Safety gloves,



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4. Appropriate safety glasses,
5. High visibility vest,
6. Hearing protection,
7. Breathing apparatus,
8. De-electric boots and gloves for protection from electrical shock.
9. Fall protection, and other applicable PPE
10. Site emergency response plan,
11. Fire extinguishers,
12. Fire blankets,
13. Respirators, masks,
14. Fire hoses,
15. First aid kits, stretchers,
16. Safety standard books



724CO09-B Competency Standard: Work in a Team Environment

Overview: This unit covers the knowledge, skills and attitudes required to gather, interpret and convey information in response to workplace requirements. It also identifies role and responsibility as a member of a team. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Obtain and convey Workplace information	<i>You must be able to:</i> P1. Assess the specific and relevant information from the appropriate sources P2. Convey the information using the appropriate medium and ideas P3. Use appropriate non- verbal communication P4. Identify appropriate lines of communication with supervisors and colleagues P5. Use the defined workplace procedures for storage of information P6. Inform co-workers and superiors about any deviation
CU2. Participate in workplace meetings and discussions	<i>You must be able to:</i> P1. Express your own opinions P2. Listen other’s point of view without interruption P3. Prepare simple questions about workplace procedures
CU3. Identify own role and responsibility within team	<i>You must be able to:</i> P1. Identify the individual role and responsibilities within the team environment. P2. Recognize the roles and responsibility of other team members. P3. Report relationships within team and external to team P4. Share report with co-workers.
CU4. Support the co-workers	<i>You must be able to:</i> P1. Hand over the required materials and tools timely to



	interfacing team P2. Work together with co-workers in an effective manner P3. Address the problems of co-worker effectively P4. Report to immediate boss
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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:

- Importance of effective communication
- Different mode of communication
- Types of non-verbal communication
- Mode of communication while operating machines
- Importance of creating cooperative work environment
- Role and objective of team.
- Different Sources of information
- Risk of failure in team work on the project.
- Importance of resolving the co-worker's problems
- Plan work and organize required resources in coordination with team
- 7Cs of communications

Critical Evidence(s) Required

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

- Prepare minutes of meeting
- Prepare questions for meeting
- Prepare a report about daily workplace tasks

Tool and Equipment

1. Note book
2. Pen
3. Pencil



724MP13-C Perform Core Drilling for Mining

Overview: This unit covers the knowledge and skills required to perform core drilling for mining. You will be able to prepare drilling site, move equipment and material to pattern and perform manual and rotary drilling. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Unit	Performance Criteria
CU1. Prepare drilling site	<i>You must be able to:</i> P1. Adjust drill within specified tolerances as per drill pattern P2. Place indicators on drill pattern in preparation for hole drilling P3. Mark out drill pattern P4. Protect pre-existing drill holes according to required hole P5. Complete required documentation
CU2. Handle equipment and materials to pattern	<i>You must be able to:</i> P1. Complete pre-operational checks to confirm drill rig for moving to work site P2. Confirm route and destination prior to movement of equipment and materials P3. Handle transportation of equipment and attachments safely to avoid damaging equipment, site and injury to personnel P4. Align drill machine in appropriate position to access drill pattern efficiently
CU3. Measure the mud parameters	<i>You must be able to:</i> P1. Measure the viscosity of given sample P2. Measure gel strength and PH of given sample
CU4. Perform manual drilling	<i>You must be able to:</i> P1. Select the area for drilling



	<p>P2. Prepare blasting area for drilling according to safety measures</p> <p>P3. Select drill bit and depth according to rock type</p> <p>P4. Operate jackhammer and hand held air compressor machine as per requirement</p> <p>P5. Perform drilling for mining process as per requirement.</p>
CU5. Perform rotary drilling	<p>You must be able to:</p> <p>P1. Select drill bit(diamond) for rotary drilling</p> <p>P2. Identify size of hole for drilling</p> <p>P3. Perform drilling for required area</p>
CU6. Perform reclamation	<p>You must be able to:</p> <p>P1. Clear site of debris</p> <p>P2. Remove drill rig and ancillary services where applicable, to allocated area</p> <p>P3. Clean all equipment as required</p> <p>P4. Store attachments and ancillary equipment</p> <p>P5. Complete all documentation as per given format</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:

- Drilling process
- Drilling techniques
- Mud parameters
- Drilling techniques
- Drilling methods
- Cleaning techniques

Tools and Equipment

The tools and equipment required for this competency standard are given below:

- Drilling equipment and machine
- Mechanical tool kit
- pH meter
- Viscometer
- Air filter restriction indicator
- Cab (horn, lights, air conditioner)



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- Display instrumentation and gauges (indicators, gauges, laser levels), computer systems
- Engine and stop engine lights (orange and red)
- Fluid levels (windscreen washer tank, hydraulic oil, coolant, grease, water, engine oil, fuel)
- Visual and audio warning devices and lights

Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Calculate mud parameters
- Perform rotary drilling
- Prepare drilling site
- Mark out drill pattern
- Move equipment and attachments safely to avoid damaging equipment, site and injury to personnel



724MP13D-Perform Blasting Operation

Overview: This unit covers the knowledge and skills required to perform blasting operation. You will be able to calculate the properties of explosives, pre-blast operations, maintain magazine /kit for blasting process and detonate site. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Unit	Performance Criteria
CU1. Identify the properties of explosives	<i>You must be able to:</i> P1. Calculate explosive energy as per Absolute Weight Strength (AWS) and Absolute Bulk Strength (ABS) formulas P2. Measure velocity and density of explosive P3. Measure detonating pressure
CU2. Prepare layout for blasting	<i>You must be able to:</i> P1. Prepare a layout for surface blasting as per site P2. Prepare a layout for underground blasting as per site
CU3. Arrange pre-blast operations	<i>You must be able to:</i> P1. Conduct rock face preparation for blasting operation P2. Select blasting agents, explosives and equipment P3. Conduct equipment pre-start (visual) checks P4. Gain relevant approvals through submitting appropriate documentation and notifications P5. Complete organization of blast on time P6. Check hole depth according to drill plan
CU4. Maintain magazine /kit for blasting process	<i>You must be able to:</i> P1. Maintain inventory control systems P2. Secure blasting agents and explosives in their packaging to avoid spillage P3. Transport blasting agents and explosives to correct location using designated route



CU5. Set-up blast site	<i>You must be able to:</i> P1. Erect physical barricades and signage P2. Primer, load, stem and tie-in holes according to blast plan P4. Return unused explosives and materials to store
CU6. Conduct post blast operations	<i>You must be able to:</i> P1. Locate and dispose misfires P2. Flag large rocks for further fragmentation P3. Record blast outcomes indicating successes, misfires and general blast results P4. Perform general house keeping
CU7. Detonate site	<i>You must be able to:</i> P1. Conduct detonation at scheduled time P2. Achieve blast design outcomes including desirable fragmentation, appropriate heave and minimum dilution P3. Minimize damage to surrounding site and blast area

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:

- K1.** Describe history of explosive products
- K2.** Define explosive and blast agents
- K3.** Low and high explosives
- K4.** Chemistry and oxygen balancing of explosives
- K5.** Explain the concept of dynamite
- K6.** ANFO/dry agent
- K7.** Blasting grade prilled
- K8.** Slurries, water agents and emulsions
- K9.** Explosive properties (strength, density, velocity and detonate pressure etc.
- K10.** Initiation system(electric and non-electric)
- K11.** Priming and its properties
- K12.** Types of priming
- K13.** Types of blast design (surface and underground)



- K14.** Rock properties
- K15.** Environmental effects of blasting
- K16.** Blasting safety
- K17.** Blasting procedures and regulations
- K18.** Emergency procedures
- K19.** Environmental and heritage procedures
- K20.** Equipment processes, technical capability and limitations
- K21.** Equipment safety requirements
- K22.** Geological and technical data
- K23.** Hazardous goods procedures and consequences of spills
- K24.** Isolation procedures
- K25.** Labeling procedures
- K26.** Mine operational system
- K27.** Night and day working procedures
- K28.** Occupational health and safety procedures
- K29.** Shutdown procedures
- K30.** Site procedures
- K31.** Startup procedures
- K32.** Storage procedures
- K33.** Types and characteristics of blasting agents, explosives and detonation mechanisms

Tools and Equipment

The tools and equipment required for this competency standard are given below:

Stationary item

- Calculator
- Stationary items
- Ancillary equipment (generators, pumps, lights, compressors, cleaning equipment, power tools, hand tools)
- Blasting machines and tools

Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:



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- Calculate the properties of explosives
- Conduct rock face preparation for blasting operation using required machinery
- Maintain magazine /kit for blasting process
- Conduct post blast operations



724MP13E-Competency Standard: Perform Conveyor Operations

Overview: After completing this competency standard candidate will be able to evaluate conveyor operations.

Competency Unit	Performance Criteria
CU1. Prepare for conveyor operations	<p><i>You must be able to:</i></p> <p>P1. Identify the production requirement</p> <p>P2. Identify potential hazards and ground conditions</p> <p>P3. Select PPEs</p>
CU2. Operate conveyor	<p><i>You must be able to:</i></p> <p>P1. Identify the activities before ,during and on completion of work</p> <p>P2. Carry out start - up and shut down procedure</p> <p>P3. Activate audio and visual safety indicators before conveyor operation commences</p> <p>P4. Monitor equipment performance utilizing appropriate indicators to aid efficient operations</p> <p>P5. Assess weight and dimension of materials</p> <p>P6. Complete work according to approved work plan and outcomes</p> <p>P7. Check smooth running of conveyor belt system as per given site</p> <p>P8. Monitor conveying process to ensure that spillage is minimized</p>
CU3. Carry out maintenance of Conveyor	<p><i>You must be able to:</i></p> <p>P1. Identify routine maintenance tasks</p> <p>P2. Conduct inspection and find faults</p> <p>P3. Prepare maintenance record</p>
CU4. Conduct housekeeping activities	<p><i>You must be able to:</i></p> <p>P1. Remove all debris from the operation site</p> <p>P2. Maintain conveyor equipment after operation</p> <p>P3. Complete all documentation as per given format</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:

- Conveying operations

Tools and Equipment

The tools and equipment required for this competency standard are given below:

- Conveyor belt and component
- Visual and audio warning devices and lights

Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Transfer mine material



724MP13F-Competency Standard C: Perform Basic Computer Operations

Overview: This Competency Standard identifies the competencies required to install basic computer hardware, software, applications and troubleshooting. Trainee will be able to apply acquired skills in operating a computer system and software such as MS Word, MS PowerPoint, MS Excel as well as installation and troubleshooting of operating system and software. The underpinning knowledge regarding basic computer operations will be sufficient to provide the basis for trainee’s work.

Competency Units	Performance Criteria
CU1. Perform basic Configuration of Computer System	You must be able to: P1. Connect computer components and peripherals as per requirement P2. Install drivers and applications according to the software specification P3. Troubleshoot applications to trace and fix faults in a specific application to bring it in a running condition
CU2. Create a document using MS word	You must be able to: P1. Compose a document as per the requirement. P2. Format Word Document according to given requirements. P3. Print Word Documents according to requirements.
CU3. Prepare Spreadsheet using MS Excel	You must be able to: P1. Develop a worksheet as per given data. P2. Format the worksheet according to given criteria. P3. Apply Formulas according to the requirement. P4. Generate Charts/Graphs according to the given data. P5. Print Worksheet according to requirements.
CU4. Prepare a presentation using MS Power Point	You must be able to: P1. Insert Slides with different Layouts according to requirements of presentation. P2. Insert text, tables, images, etc. according to the requirement. P3. Apply a set of effects to animate the slide according to requirement. P4. Apply Slide Transitions on Slides according to requirement. P5. Apply Sound Effects on Objects/text/images according to requirement. P6. Present a presentation according to 7Cs of communication.

Knowledge & Understanding

The trainee 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:

- Operating systems
- Hardware and Software



- Troubleshooting
- Hyperlink and referencing
- Printing
- Formulas
- Short Keys
- WPM (Word Per Minute)

Tools and Equipment

The tools and equipment required for this competency standard are given below:

- Computer system
- Printer

Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Install MS Office Application correctly
- Prepare a formatted document using MS Word
- Enter data into the respective columns and rows as per given instructions
- Set page layouts and margins
- Apply any slide transition on entire presentation.



724MP13G-Competency Standard: Develop 2D Drawings

Overview: This competency standard covers the skills and knowledge required to develop and prepares 2D objects. The underpinning knowledge regarding 2D drawings will be sufficient to provide the basis for trainee’s work.

Competency Units	Performance Criteria
CU1. Develop 2D Objects	<p>You must be able to:</p> <ul style="list-style-type: none">P1. Setup drawing interface for required specificationsP2. Setup user interface settings for required specificationsP3. Save AutoCAD drawing files in different file formats (DWG, PDF, and JPG).P4. Create 2D Objects with given measurementsP5. Edit 2D Objects to meet set standards
CU2. Prepare Final Set of 2D Drawings	<p>You must be able to:</p> <ul style="list-style-type: none">P1. Use appropriate command and tools to develop 2D DrawingP2. Develop 2D Drawing with given project specifications and measurementsP3. Create title block layout as requiredP4. Plot drawing on scale according to required size and orientation

Knowledge & Understanding

The trainee 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:

- K1.** Basic Drawing Settings
- K2.** Unit setting
- K3.** Limits setting
- K4.** User coordinate system Workspace setting
- K5.** Object Snap Settings
- K6.** Basic Commands and Concepts Angles and lines in AutoCAD.
- K7.** Differentiate between absolute, relative and polar system
- K8.** DIMSTYLE and MTEXT commands
- K9.** HATCHING concepts in AutoCAD
- K10.** Differentiate between CHAMFER and FILLET command
- K11.** Types of Array
- K12.** OFFSET, CIRCLE and ROTATE short commands



- K13.** Zooming options
- K14.** Tools palettes window
- K15.** Design center
- K16.** Scale and paper sizes
- K17.** Modify dimension style and text size according to paper size
- K18.** Backup file

Tool and Equipment

- ❖ Computer with all accessories
- ❖ Printer

Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Draw a Set of 2D Drawings
- Print different drawings



724MP13H-Competency Standard: Develop 3D Drawing

Overview: This competency standard covers the skills and knowledge required to develop 3D objects, manipulate and Edit 3D objects and render 3D objects. The underpinning knowledge regarding 3D drawings will be sufficient to provide the basis for trainee’s work.

Competency Units	Performance Criteria
C1. Develop 3D Objects	You must be able to: P1. Setup & save 3D drawing interface for required specifications. P2. Setup 3D user interface settings for required specifications. P3. Create 3D objects with given measurements.
C2. Manipulate 3D objects using 3D Editing Tools	You must be able to: P1. Modify 3D objects in line with the requirements. P2. Make customized 3D models according to the requirement of given job. P3. Convert 3D Face objects into a single mesh object.
C3. Render 3D Model	You must be able to: P1. Apply material to required 3D Model as per given specification P2. Apply lights to get the requisite scene of required 3D model P3. Assign cameras to execute different views of required 3D Model. P4. Render and print the 3D model according to required size & orientation. P5. Apply texture to 3D model as per given specification.

Knowledge & Understanding

The trainee 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:

K1.3D modelling in AutoCAD

- 3D solids,
- surfaces,
- meshes, and
- Wireframe objects.
- Differentiate between Surface Modelling and Solid Modelling.

K2.3D face and Edges

- Boolean operation concepts
- Subtraction



- Intersection
- Union

K3.3D Navigate control

- Functions of different camera settings.
- Importance of scene creation
- Pre-set views such as isometric, top, bottom, front, left, etc.
- Perspective projection and parallel projection
- Walk
- Constrained Orbit

K4. Material and light control

K5. Planner mapping

K6. Texture map

K7. Opacity control

K8. Render context

K9. Render sampling

Tool and Equipment

- Computer with all accessories
- Printer

Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Develop 3D Model
- Render 3D Model with cameras, lights and different materials
- Print all 3D assignments



724MP13I-Competency Standard: Manage Inventory of Mine Material

Overview: This competency standard identifies competencies required to manage inventory of mine material. You will be able to maintain log register, measure the raw material available in dump yard, perform safe storage of raw material, and inspect raw material. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Maintain the Log Register	<i>You must be able to:</i> P1. Manage the Log Register on daily basis P2. Enter the data corresponding to every type of raw material P3. Audit the Log register with on the site materials P4. Report to the in charge in case any issues are found P5. Prepare the production / dispatch record sheet
CU2. Measure the raw material available in the stack yard	<i>You must be able to:</i> P1. Calculate amount of material available on site P2. Cross check with the log register P3. Adjust the demands in accordance with the available raw materials P4. Manage the production plan accordingly
CU3. Maintain safe storage of mineral material	<i>You must be able to:</i> P1. Dump materials as per graded sizes P2. Check materials quality & quantity visually as per standard procedures P3. Maintain the log book of materials In/Out
CU4. Inspect mineral material	<i>You must be able to:</i> P1. Check the raw material quality & quantity visually as per standard procedures P2. Watch out for moisture and extra clay content with naked eye. P3. Inform material engineer if moisture and clay are out of the percentages

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:

- K1.** Types of aggregates
- K2.** Classification of aggregates according to nature of size and shape
- K3.** Characteristics of good fine and coarse aggregates
- K4.** Moisture on the aggregates
- K5.** Safety of aggregates against the weather and dust.
- K6.** Importance of gradation of aggregates.
- K7.** The flaky and elongated aggregates
- K8.** Principles of safe and efficient storage
- K9.** Material characteristics

Tool and Equipment

- Computer with all accessories
- Inventory register

Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- The candidate must present evidence of practical observations showing their ability to handle material for production process.
- Log book including quantity, quality, types of raw material, quantity of finished aggregate



COMPLETE LIST OF TOOLS AND EQUIPMENT

Sr. #	Description
1.	Computer system
2.	White board
3.	Printer
4.	Multimedia
5.	Safety Helmets
6.	Blankets
7.	Board of Safety instructions.
8.	Chain Hoist
9.	Circuit Diagrams for Plants
10.	Sieve set
11.	Digital Balance
12.	Ear Plug
13.	Face mask
14.	Fire Buckets.
15.	Fire Extinguishers
16.	First aid Kit
17.	Hand gloves
18.	Hooks / Anchors
19.	Manufacturers Operation and Maintenance Manual & Video;
20.	Measuring Tape



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21.	Multimeter
22.	Safety Apron
23.	Safety Belts
24.	Safety goggles
25.	Safety harness
26.	Safety net
27.	Safety Shoes
28.	Shovels with handle
29.	Simulated version of crushing plant operational software.
30.	Slings
31.	Spatula
32.	Spirit Level
33.	Stretcher
34.	Various hand / power tools
35.	Computers
36.	Printer
37.	Scanner
38.	Internet router
39.	Application Software
40.	Log Books
41.	Stationary Items
42.	Plant software



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43.	Cameras
44.	Jackhammer
45.	Conveyors
46.	Hoppers
47.	Steel Rules
48.	Tri Square
49.	Vernier Caliper
50.	Thread gauges
51.	Screw pitch gauges
52.	Feeler gauges
53.	Micrometer
54.	Snap Gauge set
55.	Dial Bore Gauge
56.	Set of Adjustable Wrench
57.	Set of Spanners (Open end, Ring)
58.	Pipe wrench
59.	L-key sets
60.	Nose pliers
61.	Grip pliers
62.	Straight peen Hammer
63.	Ball peen Hammer
64.	Claw Hammer



National Competency Standards for “Senior Technician in Mining Process Technology”



65.	Tong
66.	Chisel
67.	Hand hacksaw
68.	Socket set
69.	Slip joint plier
70.	Plier
71.	Inventory register
72.	Screw driver set
73.	Conveyor belt and component
74.	Visual and audio warning devices and lights
75.	Calculator
76.	Ancillary equipment (generators, pumps, lights, compressors, cleaning equipment, power tools, hand tools)
77.	Blasting machines and tools
78.	Drilling equipment and machine
79.	Mechanical tool kit
80.	pH meter
81.	Air filter restriction indicator
82.	Viscometer
83.	Cab (horn, lights, air conditioner)
84.	Display instrumentation and gauges (indicators, gauges, laser levels), computer systems
85.	Engine and stop engine lights (orange and red)



National Competency Standards for “Senior Technician in Mining Process Technology”



86.	Fluid levels (windscreen washer tank, hydraulic oil, coolant, grease, water, engine oil, fuel)
87.	Visual and audio warning devices and lights