



National Competency Standards for “Supervisor in Mining Process Technology”



**National Competency Standards
for
“Level 5- Mining Process Technology”**



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



National Competency Standards for “Supervisor in Mining Process Technology”



ACKNOWLEDGEMENT

National Vocational and Technical Training Commission (NAVTTC) 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.

NAVTTC 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. NAVTTC 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, NAVTTC 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. NAVTTC will ensure to keep the qualifications abreast with the changing demands of both national and international job markets.

**Executive Director,
NAVTTC**



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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 that 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 mining 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



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3. Date of Validation

The level 5 Mining Process Technology qualification has been validated on 04 Oct to 08 Oct, 2021 at PITAC, Lahore, by the qualification validation committee (QVC) members.

4. Date of Review

The qualification shall be reviewed after 3 years.

5. Codes of Qualifications

Qualification Title	Code
National Vocational Certificate Level 5 in Mining Process Technology “ Supervisor ”	724MP15



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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. Shahid Tufail 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. Shahid Tufail Sheikh	
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. Muneebur Rehman Khan	Measurement Engineer, ACC PVT Ltd
8.	Zeeshan Musadiq	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-5 in Mining process Technology “Supervisor”, the entry requirement is Level-4 in Mining process Technology “Assistant Supervisor” in formal institute. The entry in informal sector is not prescribed.

9. Regulation of the Qualification and schedule of units

Not applicable

10. Summary of Competency Standards



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Sr.No	Competency Standards	NVQF Level	Category	Estimated Contact Hr.			Credit Hr.
				Th.	Pr.	Total	
Supervisor in Mining Process Technology -LEVEL 5							
1.	Carry out Dewatering Activities	5	Technical	32	48	80	8
2.	Perform Soil Performing	5	Technical	24	36	60	6
3.	Interpret Geophysical Data Collection	5	Technical	15	45	60	6
4.	Perform Evaluation of Minerals	5	Technical	40	60	100	10
5.	Apply Arc GIS and Google Earth in Mining Technology	5	Technical	27	33	60	6
6.	Perform Quality Control of Aggregate, Concrete, Grout and Shotcrete	5	Technical	43	57	100	10
7.	Evaluate Rock Mechanics and Ground Control	5	Technical	27	33	60	6
8.	Perform Mine Ventilation Design and Process	5	Technical	20	30	50	5
9.	Manage Safety at Mining Site	5	Generic	24	36	60	6
10.	Manage and Supervise the Job Activities	5	Generic	32	48	80	8
11.	Plan a Project in Primavera P6	5	Generic	60	90	150	15
12.	Develop Entrepreneurial Skills	5	Generic	16	24	40	40
13.	Practice Professionalism	5	Generic	120	180	300	30
Total				480	720	1200	120



11. Details of competency standards

Level 5 - Supervisor in Mining Process

724MP15A-Manage Safety at Mining Site

Overview: This competency standard covers the skills and knowledge required to implement and maintain safe working practices at site. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Implement safe working practices at site	You must be able to: P1. Carry out tool box talks which require discussion on critical safety matters and hazardous site conditions pertaining to particular work etc. P2. Practice of Personal Protective Equipment (PPE) P3. Implement health and safety practices and ensure it is followed by subordinates P4. Implement safe handling and stacking methods at workplace / store P5. Perform appropriate posting of safety signs and boards at designated places) P6. Barricade all un-protected openings at the workplace P7. Implement and check near miss reporting P8. Provide safe access at work place for movement of workers & materials. P9. Conduct emergency response drill for enhancing importance of safety among the workers as per the policy of organization
CU2. Maintain safe work environment	You must be able to: P1. Use defined safe work practices and personal protective equipment to ensure personal safety at the workplace P2. Collect and/or dispose of all waste in accordance with environmental requirements and workplace procedures



	P3. Check condition and serviceability of equipment before storage.
CU3. Report and Investigate the accident at plant site	<p>You must be able to:</p> <p>P1. Identify any injured employee and check severity of the injury</p> <p>P2. Provide first aid treatment if required</p> <p>P3. Interview injured person and other involved personnel in the accident</p> <p>P4. Collect all information related to the incident/accident at workplace</p> <p>P5. Analyze the facts and figures by observing the accident scene</p> <p>P6. Review your recording</p> <p>P7. Perform risk assessment and hazard identification at the workplace</p> <p>P8. Develop the incident report along with corrective measures to avoid future accidents</p>
CU4. Follow vehicle safety at workplace	<p>You must be able to:</p> <p>P1. Follow the speed limit as per the company policy while driving vehicle at site</p> <p>P2. Use high visibility safety vest</p> <p>P3. Keep flag man while driving/reversing vehicle in operational areas</p> <p>P4. Follow standard procedure related to vehicle safety at workplace</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:

- Unsafe act and unsafe conditions
- Physical hazards at work site and its controlling measures
- Standard procedure of handling, storing and stacking of hazardous materials
- Safe disposal of hazardous waste
- Effect of air pollution on health
- Procedures in cases of breaches of site safety, accidents, and emergency situations



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as per guidelines

- Risk assessment and hazard identification
- Accident investigation procedure and format of accident report.
- Vehicle safety at workplace

Critical Evidence(s) Required

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

- Investigate work site accident and develop the incident report along with corrective measures to avoid future accident.
- Perform risk assessment at the workplace
- Demonstrate vehicle driving safety as per policy of the organization



724MP15B-Carry out Dewatering Activities

Overview: This competency standard covers the skills and knowledge required to carry out dewatering activities. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Organize Dewatering Activities	You must be able to: P1. Select equipment and attachments P2. Use PPEs P3. Conduct equipment pre-start (visual) checks
CU2. Control Surface Water Run-off	You must be able to: P1. Control surface runoff using watering mechanisms P2. Direct runoff to storage areas to allow settling of sediments
CU3. Lower Water Table	You must be able to: P1. Locate and mark high water table in the given area P2. Isolate dewatering area by erecting physical barricades and signage P3. Construct sumps to collect water at required location P4. Erect pumps, lines, fittings and ancillary equipment as required P5. Use equipment to maximize dewatering P6. Monitor and adjust pumping system P7. Manage water table at desired level
U4. Conduct Housekeeping Activities	You must be able to: P1. Clean attachments and other ancillary equipment P2. Complete all required documentation as per given format



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:

- K1.** Dewatering methods and limitations
- K2.** Shutdown procedures
- K3.** Site procedures
- K4.** Site safety requirements

Tools and Equipment

- De-watering equipment may include:
 - Ancillary equipment
 - Fittings
 - Lines
- Pads
 - Piping
 - Pumps
 - Submersible pumps

Critical Evidence(s) Required

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

- Control surface water run-off
- Lower water table



724MP15C-Perform Soil Profiling

Overview: This competency standard covers the skills and knowledge required to perform soil profiling. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Organize Area for Soil Profile Construction	You must be able to: P1. Select equipment and attachments P2. Select & wear PPEs P3. Conduct equipment pre-start (visual) checks
CU2. Construct Soil Profile	You must be able to: P1. Add materials to soil as per local vegetation requirements P2. Stabilize soil profile P3. Replicate the construction of soil profile horizons in the surrounding environment P4. Check landform construction P5. Place final soil layer P6. Construct soil horizon following land contour P7. Add nutrients to soil

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:

- K1.** Landform
- K2.** Soil profiling
- K3.** Soil profiling techniques
- K4.** Nutrient application
- K5.** Soil requirements
- K6.** Geological and technical data
- K7.** Principals of erosion and water runoff
- K8.** Soil horizon construction methods



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K9. Soil profiling methods

Tools & Equipment:

- pH meter
- Conductivity meter
- Shovels
- Electronic Weighing Balance
- PPEs

Critical Evidence(s) Required

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

- Perform soil profiling



724MP15 D- Interpret Geophysical Data Collection

Overview: This competency standard covers the skills and knowledge required to interpret geophysical data collection. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Select Geophysical Method	You must be able to: P1. Identify geology, tectonic setting and geomorphology of the area P2. Identify targeted mineral zone
CU2. Recognize Data Acquisition	You must be able to: P1. Layout plan of geophysical profiles targeting the mine area P2. Select on ground site for geophysical survey P3. Identify depth of penetration of targeted zone
CU3. Comprehend Geophysical Interpreted Models	You must be able to: P1. Interpret 2D/3D and sub-surface of anomalous mineral zone as per given models P2. Measure depth and area of anomalous zones P3. Analyze electrical resistivity P4. Analyze seismic velocity P5. Recognize density contrast P6. Analyze magnetic response

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:

- K1.** Different geophysical methods related to mining industry (gravity survey, Magnetic survey, electrical resistivity survey, induced polarization survey, gravity survey, seismic reflection/refraction survey and geophysical logging)

Tools and Equipment

- Geophysical equipment
- Seismograph
- Gravimeter



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- Magnetometer
- Metal detector

Critical Evidence(s) Required

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

- Comprehend geophysical interpreted models



724MP15 E-Perform Evaluation of Minerals

Overview: This competency standard covers the skills and knowledge required to perform physical, optical and chemical evaluation of minerals. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Perform Physical Evaluation of Ore	You must be able to: P1. Observe lustre of ore as per standard parameters P2. Observe Colour of ore as per standard parameters P3. Measure Streak for ore as per given table P4. Measure (MOHS) Hardness of ore P5. Estimate specific gravity as per standard
CU2. Perform Optical Evaluation of Ore	You must be able to: P1. Carry out visual inspection for ore identification P2. Carry out Optical Microscopy of ore P3. Perform Polarized Microscopy (Pleochroism) P4. Carry out Birefringence
CU3. Perform Petrographic Studies	You must be able to: P1. Select sample for test P2. Prepare the equipment for testing P3. Mount sample on glass slide/acrylic button P4. Perform grinding and polishing of the sample P5. Carry out microscopic studies P6. Perform electro-microscopic studies

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:

K1. Physical, optical and chemical evaluation of minerals

Tools and Equipment



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- Hardness tester
- Optical microscope
- Polarize microscope
- Electron microscope
- Thin section cutter, grinder and polisher
- Rock cutting machine
- Glass slides
- Electronic balance
- UV-VIS Spectrophotometer

Critical Evidence(s) Required

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

- Perform physical, optical and chemical evaluation of minerals



724MP15 F- Apply Arc GIS and Google Earth in Mining Technology

Overview: This competency standard covers the skills and knowledge required to apply GIS (Geographical Information System) in Mining Technology. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Use of Google Earth	You must be able to: P1. Setup Google earth as per job requirements P2. Access the location of the given area P3. Manipulate the coordinates as required P4. Calculate the area of the given site P5. Calculate the distance between different points
CU2. Apply Geo referencing in Arc GIS	You must be able to: P1. Upload map sheet as required P2. Assign coordinate system to uploaded sheet P3. Apply different commands in GIS as per requirement
CU3. Perform analysis In Arc GIS	You must be able to: P1. Select area for analysis P2. Outline the position of selected area P3. Identify mineral showings offshoots P4. Differentiate metallic and non-metallic mineral zones P5. Develop subsurface cross-section

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:

- K1.** Installation of Google Earth Application
- K2.** installation of Arc GIS software
- K3.** uploading of map sheet
- K4.** Basic commands of Arc GIS
- K5.** GIS analysis



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Tools and Equipment

- Google Earth Application
- GIS software
- Hard copies of different map sheets
- Stationary items

Critical Evidence(s) Required

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

- Perform analysis in GIS



724MP15 G-Perform Quality Control of Aggregate, Concrete, Grout and Shotcrete

Overview: This competency standard covers the skills and knowledge required for quality control in aggregate, concrete, grout and Shotcrete. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Perform Crushing and Grinding of Ore	You must be able to: P1. Perform crushing and grinding of the given rock sample P2. Perform sieve analysis using required mesh sizes P3. Collect and calculate the different fractions using weighing balance P4. Note down all values for given sample
CU2. Perform Impact Test	You must be able to: P1. Place sample under the knob of impact tester P2. Apply the weight and obtain the reading P3. Note down all values, displaying on screen
CU3. Perform Soundness Test	You must be able to: P1. Prepare the solution of different concentration of alkalis P2. Perform sodium and potassium reactivity test P3. Estimate the loss of material after standardized time period P4. Calculate the weight difference before and after treatment using weighing digital balance
CU4. Perform Shape Test	You must be able to: P1. Select the rock sample for testing P2. Add rock sample in flakiness gauge P3. Calculate flakiness index
CU5. Perform Specific gravity test	You must be able to: P1. Weigh the given dried sample in Air P2. Weigh the dried sample in water P3. Calculate specific gravity
CU6. Perform	You must be able to:



Absorption test	<p>P1.Weigh the dried sample in Air</p> <p>P2.Add the dried sample in water</p> <p>P3.Calculate the percentage of absorption</p>
CU7. Perform slump test for concrete and Shotcrete	<p>You must be able to:</p> <p>P1.Collect fresh concrete sample in slump cone at given site</p> <p>P2.Place the concrete in cone</p> <p>P3.Perform Roding in the concrete with temping rod</p> <p>P4.Remove the slump cone and observe concrete flow</p> <p>P5.Measure the value with scale as per standard</p>
CU8. Perform Compressive strength test of concrete and Grout	<p>You must be able to:</p> <p>P1.Prepare cylinder/cubes of concrete for compressive strength test</p> <p>P2.Dip cylinder/cubes in water</p> <p>P3.Crush the cylinder/cubes in compressive strength machine</p> <p>P4.Note down the value 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:

- K1.**Types of aggregate
- K2.**Knowledge about the weathering of Rocks.
- K3.**Knowledge about the Flaky and elongated Particles
- K4.**Archimedes’ law

Tools and Equipment

- Jaw crusher
- Roll crusher
- Ball mill
- Rod Mill
- Dry sieve Analyzer
- Wet sieve Analyzer
- SS Cylinder for Alkali silica
- Universal testing machine
- Slump cone, rod, scale
- Digital balance
- Glass ware
- Specific Gravity bottle



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- Viscometer
- pH Meter

Critical Evidence(s) Required

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

- Perform crushing and grinding of the given rock sample by using jaw and roll crusher
- Perform sieve analysis using required mesh sizes
- Perform Soundness Test
- Calculate the weight after specific time period
- Measure the value with scale as per standard
- Prepare cylinder/cubes of Concrete/Grout for compressive strength test



724MP15 H-Evaluate Rock Mechanics and Ground Control

Overview:

This competency standard covers the skills and knowledge required to evaluate rock mechanics and ground control. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Evaluate The Mechanical Properties of Rock	<p>You must be able to:</p> <p>P1. Identify the mechanical properties of rock (brittle, ductile)</p> <p>P2. Carry out Tri-axial test (to bear load strength of rock material)</p> <p>P3. Calculate Unconfined compressive strength (UCS) (to find the compressive strength of rock material)</p> <p>P4. Carry out Ring shear test (gives shear strength of rock as a function of confining pressure)</p> <p>P5. Carry out Split tensile test (tensile strength of material e.g., Concrete and rock like material)</p> <p>P6. Perform Beam bending test for flexure / flexure test (rock specimen is subjected to bending till failure occurs)</p>
CU2. Perform geological services	<p>You must be able to:</p> <p>P1. Prepare rock sample for microscopy</p> <p>P2. Perform petrography of given sample</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:

- K1.** Shear strength formula for rock material
- K2.** Tensile strength formula for rock material
- K3.** Modulus of rupture (flexure strength)

Tools and Equipment

- Universal testing machine (UTM)
- Test cell, hydraulic pump
- Straight circular cylinder



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- Brazilian test apparatus
- Pressure jack and gauge
- Optical microscope
- Polarize microscope
- Chemicals

Critical Evidence(s) Required

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

- Evaluate The Mechanical Properties of Rock



724MP15I-Perform Mine Ventilation Design and Process

Overview: This competency standard covers the skills and knowledge required to perform mine ventilation design and process. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
CU1. Perform Qualitative Survey	<p>You must be able to:</p> <p>P1. Use portable gas detector</p> <p>P2. Detect gas hazard in mine</p> <p>P3. Use PPEs as required</p>
CU2. Layout The Basic Mine Ventilation System	<p>You must be able to:</p> <p>P1. Perform survey for installation of ventilation system</p> <p>P2. Collect ventilation data base</p> <p>P3. Check optimization through simulator</p> <p>P4. Develop model for ventilation system</p>
CU3. Comprehend The Basic Rules for Ventilation System	<p>You must be able to:</p> <p>P1. Identify the air flow system of ventilation system</p> <p>P2. Make a layout on paper of ventilation system</p> <p>P3. Outline the layout of single and double split system</p> <p>P4. Calculate area, volume and velocity of air for specified mine location</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:

K1. Ventilation system

K2. Design of mine ventilation system

Tools and Equipment:

- Anemometer
- Multi Gas Detector
- Tube Detector
- Gas Mask
- Brattice cloth
- Axial Flow Fan
- Centrifugal Flow Fan



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Critical Evidence(s) Required

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

- Layout the basic mine ventilation system



724CO11J -Competency Standard: Manage and Supervise the Job Activities

Overview: This competency standard covers the skills and knowledge required to manage and supervise the job activities. You will be able to plan and supervise on-site operations / activities and doing the on -site inspection and prepare a report .Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Unit	Performance Criteria
CU1. Plan for on-site operations	You must be able to: P1. Consult with the client to obtain required information P2. Prepare SOP’s in accordance with the identified requirements. P3. Prepare the process flow diagram in order to achieve Quality outcome. P4. Break down work of activities into small achievable components and efficient sequences P5. Recognize site hazards and the personal protective equipment (PPE) and safety procedures specified for job P6. Organize site induction for support personnel as required P7. Plan housekeeping activities prior to and post completion of work
CU2. Supervise work activities to achieve desired results	You must be able to: P1. List and arrange required resources prior to commencement of work P2. Recognize the areas of work which could result in a delay of work, wastage of material or damage to tools. P3. Allocate responsibility to required team members to avoid conflicts P4. Review work plan in response to new information, urgent requests, changed situations or instructions from concern personnel P5. Cooperate with team members to achieve common goals
CU3. Perform on- site inspection	You must be able to: P1. Conduct inspection of processes & materials according to



	<p>inspection plan</p> <p>P2. Identify defects and deficiencies in product & processes</p> <p>P3. Record defects and deficiencies with evidence in product & processes (if required)</p> <p>P4. Perform test as per standard procedure for determining the physical properties of materials and product.</p> <p>P5. Collect the samples of materials & products for lab testing as per standards</p> <p>P6. Complete the sampling document as per requirement</p> <p>P7. Check the actions taken for rectification of snag list</p> <p>P8. Record the non-compliance and expected breaches of contract as per SOPs.</p>
<p>CU4. Prepare the inspection report.</p>	<p><i>You must be able to:</i></p> <p>P1. Collect and review the information relevant to inspection activities for recoding inspection results</p> <p>P2. Verify the integrity of information supplied by other party as a part of the inspection process</p> <p>P3. Record inspection observations and findings</p> <p>P4. Recommend the necessary corrective actions for tackling the identified problems</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:

- Principles of planning and project management
- Roles and responsibilities for different levels of site supervision.
- Information relevant to inspection activities and work document preparation for recoding inspection results.
- Documentation and record system of the inspection body
- Different types of deficiencies in inspection activities
- Site problems and recommended corrective actions
- Awareness of environmental sustainability issues as they relate to the work task.

Critical Evidence(s) Required



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The candidate needs to produce any or all of the following documents/evidences:

- Design effectively the supervision and inspection program in accordance with specifications
- Handle inspection items and samples by appropriate methods to meet the traceability requirements.
- Collaborate with the team members for allied works at site.



724CO11K- Competency Standard: Plan a Project in Primavera P6

Overview: This competency standard deal with learning the competencies needed to plan a project in Primavera P6. You can perform basic operation, project activities scheduling and resources costing and planning Primavera P6. You will manage project in Primavera P6. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Unit	Performance Criteria
CU1. Perform Basic operation in Primavera P6	You must be able to: P1. Load & unload primavera P6 Software. P2. Prepare interface of software P3. Customize P6 Screen Layout P4. Create WBS of project in Primavera.
CU2. Perform Project Activities Scheduling in Primavera P6	You must be able to: P1. Add Project in Primavera P2. Create Activities of project in Primavera. P3. Create Relationships between activities of project in Primavera. P4. Create Schedule of activities of project in Primavera. P5. Display Gantt Chart
CU3. Perform Project Resources Costing & Planning in Primavera P6	You must be able to: P1. Add constraints of activities of project in Primavera. P2. Create Calendar for activities of project in Primavera. P3. Assign Calendars to activities of project in Primavera. P4. Add Resources to activities of project in Primavera. P5. Assign Resources of activities of project in Primavera. P6. Add Cost of activities of project in Primavera. P7. Analyze Resources of activities of project in Primavera. P8. Perform Baseline process for Project.
CU4. Manage Project in Primavera P6	You must be able to: P1. Status the Project P2. Mitigate the schedule

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:

- Physical performance to Customized screen layout
- Activity Constraints
- Work calendar, work/non-work days, working hours
- Roles and Hourly Rates



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- Baselines and describe their use in evaluating project performance
- Stages of project execution
- Project monitoring and control

Critical Evidence(s) Required

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

- Managed Project - project progress, planned baseline, Resource leveling and describe its purpose, comparison graphically, project progress for a specified time period



041300860L -Competency Standard: Develop Entrepreneurial Skills

Overview: This Competency Standard identifies the competencies required to develop entrepreneurial skills, in accordance with the organization’s approved guidelines and procedures. You will be expected to develop a business plan, collect information regarding funding sources, develop a marketing plan and develop basic business communication skills. Your underpinning knowledge regarding entrepreneurial skills will be sufficient to provide you the basis for your work.

Competency Unit	Performance Criteria
CU1. Develop a business plan	<p>You must be able to:</p> <p>P1. Conduct market survey to collect information</p> <p>P2. Select the best option in terms of cost, service, quality, sales, profit margin, overall expenses</p> <p>P3. Compile the information collected through the market survey, in the business plan format</p>
CU2. Collect information regarding funding sources	<p>You must be able to:</p> <p>P1. Identify the available funding sources based on their terms and conditions, maximum loan limit, payback time, interest rate</p> <p>P2. Choose the best available option according to investment requirement</p> <p>P3. Prepare documents according to the loan agreement requirement</p> <p>P4. Include the information of funding sources in the business plan</p>
CU3. Develop a marketing plan	<p>You must be able to:</p> <p>P1. Collect information required to devise marketing plan</p> <p>P2. Prepare marketing plan for new business</p>
CU4. Develop basic business communication skills	<p>You must be able to:</p> <p>P1. Communicate with internal customers and external customers</p> <p>P2. Use different modes of communication to communicate internally and externally e.g.: presentation, speaking, writing, listening, visual representation, reading etc.</p> <p>P3. Use specific business terms used in the market</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:

- 7ps of marketing including product, price, placement, promotion, people, packaging and positioning
- 7Cs of business communication
- Different modes of communication and their application in the industry



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- Business terms used in the industry
- Funding sources
- How to get loan to start a new business
- Market survey and its tools e.g.: questionnaire, interview, observation etc
- Market trends for specific product offering
- Elements of business plan
- How to fill the business plan format

Critical Evidence(s) Required

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

- Conduct market survey and formulate business plans in terms of feasibility, investment potential, risk, and completeness.
- Effectively present business ideas and profile



724CO11M-Competency Standard: Practice Professionalism

Overview: This competency standard deal with learning the competencies needed to develop portfolio for industry. You can perform internship. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Unit	Performance Criteria
CU1. Develop Portfolio for industry	You must be able to: P1. Select previous assignments for portfolio P2. Work on previous selected assignments for portfolio P3. Compile variety of assignments for portfolio P4. Make Professional Portfolio for industry P5. Develop Digital Portfolio for industry
CU2. Perform Internship	You must be able to: P1. Prepare for internship <ul style="list-style-type: none">• Personal Presentation• Portfolio Presentation P2. Interview preparation P3. Demonstrate Ethics for Internship P4. Identify Industry for internship P5. Perform Internship in Industry <ul style="list-style-type: none">• Fill the Performa of Internship• Report the performance of internship

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:

- Importance of portfolio
- Ethics for Internship

Critical Evidence(s) Required

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

- Professional
- Portfolio



COMPLETE LIST OF TOOLS AND EQUIPMENT

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



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21.	Safety harness
22.	Safety net
23.	Safety Shoes
24.	Geophysical equipment
25.	Seismograph
26.	Gravimeter
27.	Magnetometer
28.	Metal detector
29.	pH meter
30.	Conductivity meter
31.	Shovels
32.	Electronic Weighing Balance
33.	De-watering equipment may include: <ul style="list-style-type: none">• Ancillary equipment• Fittings• Lines• Pads• Piping• Pumps• Submersible pumps
34.	Hardness tester
35.	Rock cutting machine
36.	Thin section cutter, grinder and polisher
37.	Electron microscope
38.	Glass slides



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39.	Electronic balance
40.	UV-VIS Spectrophotometer
41.	Google Earth Application
42.	GIS software
43.	Hard copies of different map sheets
44.	Jaw crusher
45.	Roll crusher
46.	Ball mill
47.	Rod Mill
48.	Dry sieve Analyzer
49.	Wet sieve Analyzer
50.	SS Cylinder for Alkali silica
51.	Universal testing machine
52.	Slump cone, rod, scale
53.	Digital balance
54.	Glass ware
55.	Specific Gravity bottle
56.	Viscometer
57.	Straight circular cylinder
58.	Brazilian test apparatus
59.	Pressure jack and gauge
60.	Optical microscope



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61.	Polarize microscope
62.	Chemicals
63.	Universal testing machine (UTM)
64.	Test cell, hydraulic pump
65.	Anemometer
66.	Multi Gas Detector
67.	Tube Detector
68.	Gas Mask
69.	Brattice cloth
70.	Axial Flow Fan
71.	Centrifugal Flow Fan

