QUALIFICATION PACK - OCCUPATIONAL STANDARD FOR MINING INDUSTRY

What are Occupational Standards (OS)?

- OS describe what individuals need to do, know and understand in order to carry out a particular job role or function
- OS are performance standard that individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding

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Introduction

Qualifications Pack- Mine Machinist

SECTOR: MINING

SUB-SECTOR: Underground and Open Cast Mines

OCCUPATION: Mechanical Maintenance

REFERENCE ID: MIN/Q 0424

ALIGNED TO: NCO-2004/NIL

A Mine machinist executes end to end machining activities required at the mine

Brief Job Description: Mine Machinist reads and interprets the work-process documentation to perform cutting, shaping, and finishing metal to make machine precision machining parts and components, also sets up and operates conventional and numerically controlled metal-cutting machines and equipment including saws, drills, grinders, lathes, and mills and performs work-in-process measuring or checking using specialized and precision tools and equipment

Personal Attributes: This job requires the individual to be detail oriented, observant; should have a good level of hand eye coordination, dexterity and alertness towards quality. Reading, writing and communication skills and sensitivity towards safety for self and equipment

Job Details

Qualification Pack Code	**MIN/Q 0424**		
Job Role	**Mining Machinist**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Industry	**MINING**	**Drafted on**	**15/12/2014**
Sub-sector	**Underground and Open Cast Mines**	**Last reviewed on**	**24/03/2015**
Occupation	**Mechanical Maintenance**	**Next review date**	**24/03/2017**

Job Role	**Mine Machinist**
Role Description	Perform cutting, shaping, and finishing metal to make machine precision machining parts and components, also sets up and operates conventional and numerically controlled metal-cutting machines and equipment including saws, drills, grinders, lathes, and mills and performs work-in-process measuring or checking using specialized and precision tools and equipment
NSQF level **Minimum Educational Qualification** **Maximum Educational Qualification**	4 ITI Machinist NA
Training (Suggested but not mandatory)	1. Different types of machining activities (Turning, Milling Grinding etc)and usage of fixtures tools etc 2. 5S and Safety 3. Process Documentation 4. Concepts SPC
Experience	1 – 10 Years
Applicable National Occupational Standards	**Compulsory:** **Click on the hyperlink to read/download the required NOS** 1. MIN/N 0468 (Prepare for machining operations) 2. MIN/N 0469: (Perform machining operations) 3. MIN/N 0470: (Conducting all post machining operations) 4. MIN/N0901: (Health and Safety) **Optional:** Not Applicable
Performance Criteria	As described in the relevant OS units

Definitions

Keywords /Terms	Description
Sector	Sector is a conglomeration of different business operations having similar businesses and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/related set of functions in an industry.
Function	Function is an activity necessary for achieving the key purpose of the sector, occupation, or area of work, which can be carried out by a person or a group of persons. Functions are identified through functional analysis and form the basis of OS.
Job Role	Job role defines a unique set of functions that together form a unique employment opportunity in an organization.
OS	OS specify the standard of performance an individual must achieve when carrying out a function in the workplace, together with the knowledge and understanding they need to meet that standard consistently. Occupational Standard are applicable both in the Indian and global contexts.
Performance Criteria	Performance Criteria are statements that together specify the standard of performance required when carrying out a task.
NOS	NOS are Occupational Standard which apply uniquely in the Indian context.
Qualification Pack Code	Qualification Pack Code is a unique reference code that identifies a qualification pack.
Qualification Pack	Qualification Pack comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A Qualification Pack is assigned a unique qualification pack code.
Unit Code	Unit Code is a unique identifier for an Occupational Standard , which is denoted by an 'N'
Unit Title	Unit Title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Knowledge and Understanding	Knowledge and Understanding are statements which together specify the technical, generic, professional and organizational specific knowledge that an individual needs in order to perform to the required standard.
Organizational Context	Organizational Context includes the way the organization is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical Knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills or Generic Skills	Core Skills or Generic Skills are a group of skills that are key to learning and working in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.

Acronyms

Keywords /Terms	Description
SCMS	Skill council for Mining Sector
NOS	National Occupational Standard
NSQF	National Skill Qualification Framework
NVEQF	National Vocational Educational Qualification Framework
NVQF	National Vocational Qualification Framework
OS	Occupational Standard
PC	Performance Criteria
QP	Qualification Pack
SSC	Sector Skill Council

National Occupational Standard

Overview

This OS is about planning and preparing for machining job by understanding work process documentation, working material, selecting cutting fluids, machines, machine controls and systems, tooling, measuring or checking devices, identifying and preparing cutting tools; selecting speeds and feeds as per the requirement

MIN/ N0468 Prepare for machining operations

National Occupational Standard

Unit Code	MIN/ N0468
Unit Title (Task)	**Prepare for machining operations**
Description	This OS unit is about carrying out pre-machining activities either manually or through specialized techniques as per the given work order and the standards specified by the organization.
Scope	This unit/task covers the following: • Interpret job specification through drawings, sketches and sample work piece • Identify and select machines, cutting fluids and cutting tools • Prepare machines, cutting tools and measuring tools for the job

Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Interpret job specification through drawings, sketches and sample work piece	PC1. Read and interpret engineering drawings, sketches or sample work piece to identify dimensions and tolerances, machine surface designations and allowances, type and features of work piece material PC2. Read and interpret work-process documentation to identify required machines, job operation, sequencing of job, method of machining and set-ups PC3. Perform calculations for machining operations including determining speeds and feeds, calculating cutting tool positions, checking work piece alignments, and calculating dimensions to be measured and verified
Identify and select machines, cutting fluids and cutting tools	PC4. Identify and select machines including conventional and numerically controlled saws, drills, lathes, grinders, and vertical or horizontal mills, using information from engineering drawings and work process documentation, to ensure that the machine selected is the correct one for the application and available to perform the job PC5. Identify and select cutting fluids using manuals, charts, engineering drawings, and material safety data sheets, ensuring that the cutting fluid selected is the correct one to maximize machining without damage to work piece, cutting tool, or machine PC6. Identify and select tooling required to cut the work piece by using information in engineering drawings and job instructions

Prepare machines, cutting tools and measuring tools for the job	PC7. Identify and prepare cutting tools by sharpening or replacing tools so that the cutting shape and angle are prepared for optimum cutting and personal safety in accordance with manufacturer's specifications, engineering drawings, sketches, sample work piece and company standards/procedures PC8. Identify and check machine controls and systems including locating and identifying switches, buttons, levers, controls, and safety devices, to ensure that all controls are operational and functioning PC9. Verify work piece material for correct size and type by checking codes, lettering, or numerical stamps to ensure that the work piece selected conforms to job instruction specification PC10. Identify and select measuring instruments and checking devices, ensuring that instruments and devices selected are capable of measuring to obtain the dimensions and tolerances specified as per the job specifications PC11. Select machine speeds and feeds using speed and feed charts and in accordance with size, type, and hardness of work piece materials
Knowledge and Understanding (K) w.r.t. the scope	
A. **Regulatory context (knowledge of safety guidelines specified by Director General of Mine Safety (DGMS))**	The user/individual on the job needs to know and understand: KA1. Different types of mines and detail of the mine he is working in KA2. Mine Organisation, time keeping, need for discipline and punctuality KA3. Benching in quarries, Dressing of overhangs, Undercuts, Fencing, First aid and Hygiene KA4. Standing orders in force at the mine. Safety in the vicinity of machinery KA5. Shot-firing and Safety regulations. How and where to take shelter KA6. Duties of workmen KA7. Provision of wages, working hours and accident compensation as per Mines act KA8. Knowledge of mining safety procedures KA9. Impact of violation of safely procedures
B. Organisational Context (Knowledge of the Company/ Organisation and	The user/individual on the job needs to know and understand: KB1. Relevant standards and procedures followed in the company KB2. Different types of products that require servicing KB3. Different types of machine tools available

its processes)	
C. Technical Knowledge	The user/individual on the job needs to know and understand: KC1. Operation and mechanism of Drilling Machine, Power Saw, Lathe, Milling Machine, Grinders and abrasives, Boring Mills and their specific usage KC2. Perform calculations using formulas involving ratios, conversions, algebra, basic geometry and trigonometry to solve problems with tapers, dovetails and layout procedures (chords) KC3. Describe, use and interpret information from calipers and gauges (thread, plug, taper, snap and ring etc.) and digital type measuring instruments KC4. Identify geometric dimensions, fits and tolerances (e.g. Concentricity, roundness, angularity, flatness, perpendicularity, runouts, datums etc.) KC5. Understand and describe characteristics of different types of ferrous, non-ferrous metals and alloys (wear resistance, weight, flexibility, hardness, toughness, machinability, etc.) KC6. Sequence of milling operations, and planning the operation sequence (e.g. square up block, key seating, helical, Spline etc.) KC7. Threads (unified, metric, acme, pipe, non-standard etc., including angle, pitch, lead etc. for each type of thread) , methods of threading (internal, tapping, tapered, offset etc.), calculating cutting and measuring threads on a lathe machine KC8. Selecting, installing and removing cutting tools and holders KC9. Setting speeds and feeds by calculating as per the feed/speed chart to account for material type, cutter type, cutter size, rigidity and power of the machine KC10. Purpose and usage of cutting fluids (e.g. lubrication, cooling, chip removal, tool life etc.) KC11. Selecting types of cutting fluids for specific applications (straight oils, soluble oils, semi-synthetic, synthetic etc.) KC12. Knowledge of cutting tool grinding KC13. Knowledge of workshop technology
Skills (S) w.r.t. the scope	
A. Core Skills/ Generic Skills	**Writing skills**
	The user/ individual on the job needs to know and understand how to:

	SA1. Write basic level notes and observations SA2. Draw basic level geometrical /mechanical drawings and charts
	Reading skills
	SA3. Read and interpret workplace related documentation SA4. Read and interpret engineering drawings and sketches
	Oral Communication (Listening and Speaking skills)
	SA5. Discuss task lists and job requirements with co-workers SA6. Effectively communicate information to team members SA7. Discuss with supervisor in order to understand the nature of the problem SA8. Attentively listen with full attention and comprehend the information given by the speaker
B. Professional Skills	**Problem Solving and Decision making**
	The user/individual on the job needs to know and understand how to: SB1. Judge when to ask for help from a supervisor SB2. Suggest options in case any issue is observed during operations
	Plan and Organise
	SB3. Plan work assigned on a daily basis and provide estimates of time required for each piece of work SB4. Prioritize actions to achieve required outcomes
	Analytical thinking
	SB5. Analyse the complexity of work to determine if it can be successfully carried out. SB6. Analyse the causes for defects e.g. if it is related to the cutting tool, machine, fixture.

NOS Version Control

NOS Code	**MIN/ N0468**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Sector	**Mining**	**Drafted on**	**15/12/2014**
Sub-sector	**Underground and Open Cast Mines**	**Last reviewed on**	**24/03/2015**
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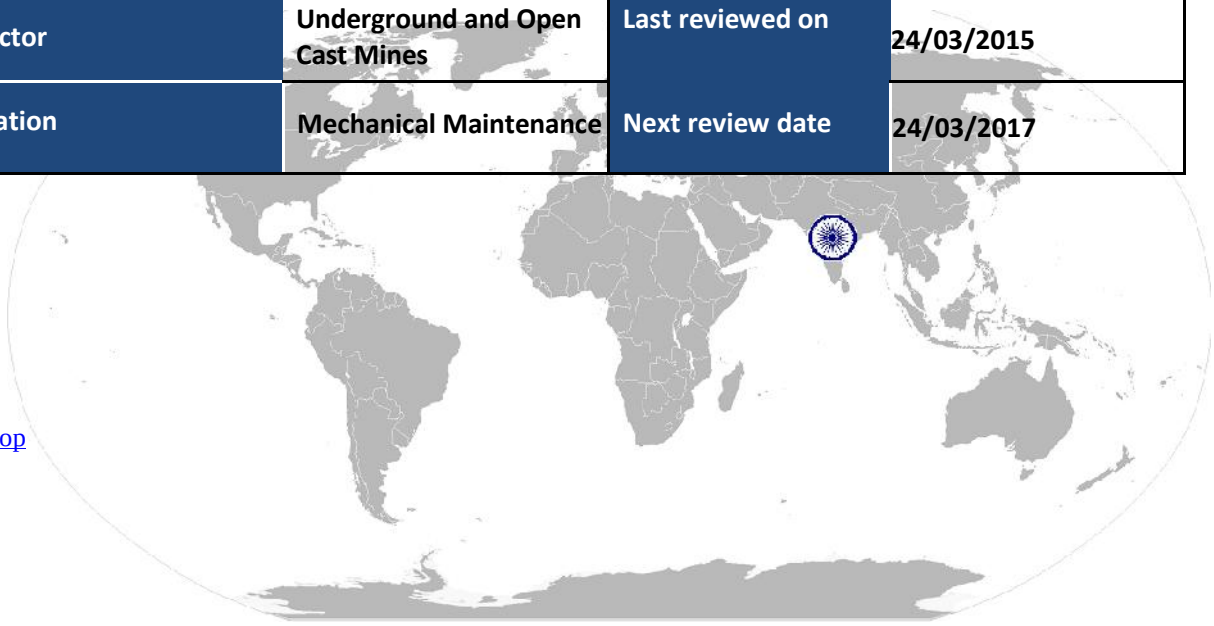

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National Occupational Standard

Overview

This Occupational Standard describes the knowledge, understanding and skills required in performing different machining activities

National Occupational Standard

Unit Code	MIN/ N0469
Unit Title (Task)	**Performing machining operations**
Description	This unit is about carrying out the machining process.
Scope	This unit/task covers the following: • Perform work in process dimensional or surface verification, Bench work, Sawing, Drilling, Milling • Finishing Job & Documentation

Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Perform work in process dimensional or surface verification	PC1. Check straight cuts by using precision measuring instruments including (not limited to) micrometer, verniers, callipers, squares, straight edge, dial indicator, and surface comparator, to ensure that the accurate size, finish, parallelism, and squareness of straight cuts conform with job specifications PC2. Check shapes by using precision measuring instruments and checking devices including (not limited to) radius gauges, surface comparator, and verniers, to ensure that the profile and finish of the cut shape conform to engineering drawing and job specifications PC3. Check threads by using precision measuring instruments, checking devices, and various checking methods including (not limited to) 3-wire method, thread micrometer, thread gauge, and plug or ring gauges, to ensure that the accuracy of pitch, thread geometry, and size of cut threads conform to job specifications PC4. Check holes by using precision measuring instruments and checking devices including (not limited to) dial indicators, bore gauges, plug gauges, telescopic gauges, surface comparators, and vernier, to ensure that the accuracy of the diameter, depth, concentricity, position, and finish of cut holes conform with engineering drawings and job specifications PC5. Check tapers using precision measuring instruments and checking devices including (not limited to) taper gauge, sine bar, micrometer, and vernier to ensure that the accuracy of the angle, taper/foot, and diameter of the cut tapers conform with engineering drawings and job specifications PC6. Check hardness using various types of hardness testers and comparison charts to ensure that the hardness level of the work piece materials conforms with

	engineering drawings and job specifications
Perform Bench work	PC7. Hand-file using files including (not limited to) flat, needle, rat-tail, lathe, and half-round files to remove excessive material so that workpiece is filed PC8. Hand-saw using cut-off saws to cut workpiece to specified lengths in accordance with job specifications PC9. Hand-drill holes using power drill and drill bits so that the size of the drilled hole conform with job specifications PC10. Hand-grind using pneumatic or electric hand grinders to remove excess material, so that the work piece is ground in accordance with job specifications
Perform Sawing	PC11. Check fused/welded blade to ensure that joined saw has a continuous cutting edge in accordance with manufacturer's or job specifications PC12. Lay out features of engineering drawings on to the workpiece using precision measuring instruments and layout equipment including (not limited to) scriber, centre, punch, vernier height gauge, surface plate, combination set, and layout medium or dyes PC13. Locate and position workpiece in saw to required operational clearances by setting up work holding devices including (not limited to) clamps, nesting fixtures, vises, or roller supports, so that the workpiece is aligned, secured, and stable during sawing operations PC14. Select speeds and feeds of saws using speed and feed charts and in accordance with the size, type, and hardness of workpiece material, so that the saw performs optimum cutting without damage to workpiece, cutting tools, or machines, and ensures personal safety PC15. Install and test-run blade to check alignments and movements, so that the blade is installed to make the required cut, prevents machine or blade damage, and ensures personal safety PC16. Check first cut-off by measuring and checking a cut-off piece, to ensure that the angles, squareness, and length of the sawed piece conform to job specifications PC17. Cut shapes using a vertical bandsaw using required sawing sequences, speeds, feeds, and cutting fluids, so that the profile, size, and dimensions of the cut shapes conform to job specifications PC18. Deburr workpiece using files, scrapers, emery cloth, sanders, and hand or

	pedestal grinders, to remove excess material and to ensure safe handling PC19. Perform final inspection using precision measuring instruments and checking devices including (not limited to) inside and outside micrometers, vernier height gauges or indicators, gauge blocks, and pin gauges, to ensure that the tolerances and dimensions of the sawed workpiece conform to the engineering drawings and job specifications
Perform Drilling Operations	PC20. Select drill tooling including drill bits, centre-drill, reamers, taps, counter-bores, countersinks, and spot-faces by using information in engineering drawings and job specifications to ensure that tooling is the correct size, shape, type, and grade for the application PC21. Identify and prepare cutting tools for drills by sharpening or replacing tools, so that the cutting shape and angle is prepared for optimum cutting and personal safety PC22. Locate and position workpiece in drill to required operational clearances by setting up and securing workpiece with work holding devices including (not limited to) drilling vises, clamps, jigs, angle plates, and chucks, so that the workpiece is aligned, secured, and stable during drilling in accordance with job specifications PC23. Set up tooling in drills to required operational alignments using holding devices including (not limited to) drill chucks, taper sleeves, and tapping heads, to ensure that tooling is in position and held securely during drilling PC24. Select speeds and feeds of drill using speed and feed charts and in accordance with the size, type, and hardness of workpiece material, so that the drill performs optimum cutting without damage to workpiece, cutting tools, or machines, and ensures personal safety PC25. Centre-drill a layout punch mark using a drill press/machine, chuck, centre-drill, and cutting fluid, so that the punch mark is drilled in accordance with job specifications PC26. Drill a hole using a drilling machine, drill bits, and cutting fluids, so that the size and depth of drilled hole conform to job specifications PC27. Chamfer/ Ream a hole using a drilling machine, countersinks, reamers and cutting fluids to break sharp edges/ and to produce a reamed hole

	PC28. Perform counter-boring/counter-sinking using a drilling machine, countersinks, and cutting fluids to conform to job specifications
Perform Lathe work	PC29. Select lathe cutting tools including (not limited to) drill bits, boring, parting, threading, facing, or turning tools, by using information from engineering drawings and job instructions PC30. Identify and prepare lathe cutting tools by sharpening or replacing, so that cutting shape & angle is prepared for optimum cutting efficiency & safety PC31. Locate and position workpiece in lathe to required operational clearances by setting up and securing workholding devices including (not limited to) chucks, face plates, centres, catch plates, steady rest, or tail stock, so that the workpiece is aligned, secured, and stable PC32. Set up lathe cutting tools to required operational alignments using tool posts and tail stocks, to ensure that tools are in position and held securely PC33. Select speeds and feeds of lathe using speed and feed charts and in accordance with the size, type, and hardness of workpiece material, so that the lathe performs optimum cutting without damage to workpiece, cutting tools, or machine and ensures personal safety PC34. Take a sizing (preliminary) cut to determine reference workface and to check speeds and feeds to ensure that lathe is set up PC35. Establish a reference or starting point (datum) by zeroing out machine and ensuring that the datum is correctly located PC36. Face a surface using a lathe and single-point tool bit and by measuring or checking with vernier, straight edge, or micrometer, so that the surface flatness and finished edge conform to engineering drawings and job specifications PC37. Turn an external diameter using a lathe and single-point tool and by measuring or checking with a vernier or micrometer, so that the turned diameter conforms to engineering drawings and job specifications PC38. Drill a hole using a lathe, centre-drill, drills, and tailstock, so that the diameter and depth of the drilled hole conform to job specifications PC39. Bore an internal diameter using a lathe and boring bars mounted in a toolpost, so that the close-toleranced internal diameters conform to engineering drawings and job specifications

	PC40. Ream a hole using a lathe, centre-drill, drills, reamers, and tail-stock, and by measuring or checking with vernier, micrometer, and gauges PC41. Tap a hole using on lathe, taps, tapping head, and tailstock, so that the depth, diameter, and thread pitch of the tapped hole are as per the desired specifications PC42. Turn an internal or external thread using a lathe and single-point tool bit and by measuring or checking with thread micrometers and thread plug gauge (go-no-go) PC43. Produce a taper using a lathe, offset tail stock, taper-turning attachment, and compound rest, and by measuring or checking with protractors, micrometers,
Perform Milling Operations	PC44. Select milling cutting tools including (not limited to) end mills, face mills, shell cutters, slot drills, boring bars, slitting saws, and boring head PC45. Identify and prepare milling cutting tools by sharpening or replacing tools so that the cutting shape and angle is prepared for optimum cutting and personal safety PC46. Set-up and maintain milling adjustable support tools including (not limited to) indexing heads, vises, angle plates, sine bars, and tables, ensuring that the support tool is the correct one for the application and the workpiece is located and secured during machining PC47. Set-up milling cutting tools to required operational alignments using arbours, collets, and drill chucks, to ensure the tools are in position and held securely during machining PC48. Select speeds and feeds of mill using speed and feed charts and in accordance with the size, type, and hardness of workpiece material, so that the mill performs optimum cutting without damage to workpiece, cutting tools, or machine and ensures personal safety PC49. Face-mill using a milling machine, multi-point tool bit, face mill, and required cutting fluids, so that the size, shape, squareness, and flatness of the faced workpiece conform to engineering drawings and job specifications PC50. Machine steps, cut-outs, angles, and open slots using a milling machine, end mill, and required cutting fluid, so that the size, shape, and angle of the end-milled workpiece conform to engineering drawings and job specifications

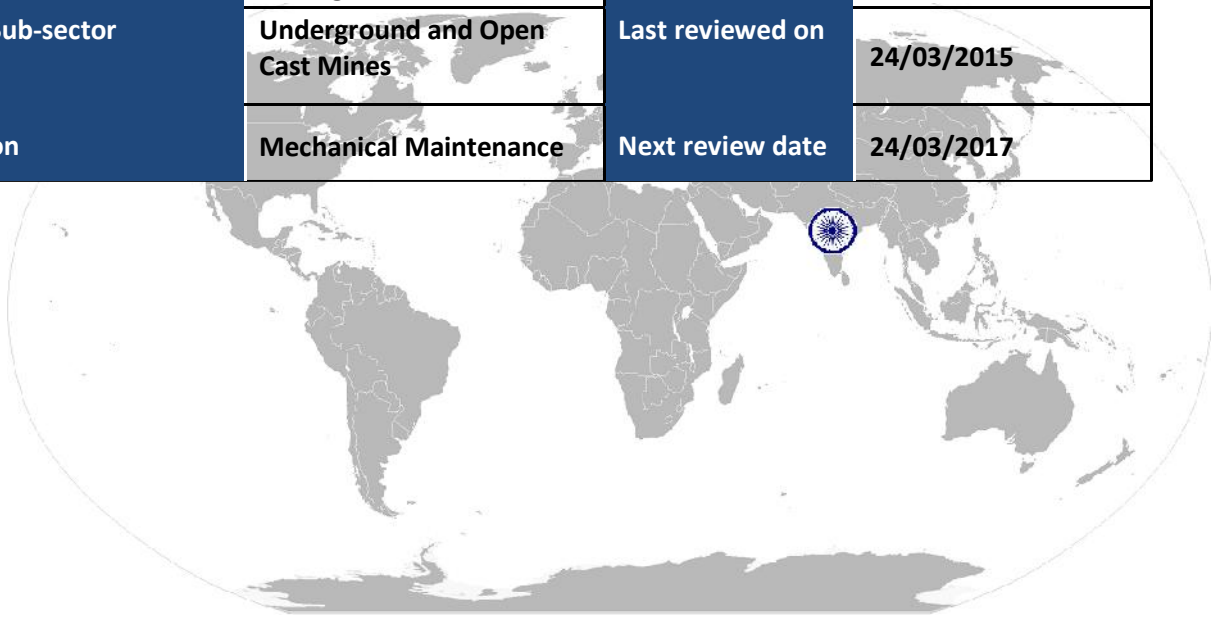
Finishing Job & Documentation	PC51. Debur work piece using files, scrapers, emery cloth, sanders, and hand or pedestal grinders to remove excess material and to ensure safe handling in accordance with engineering drawings, job specifications PC52. Perform final inspection using precision measuring instruments and checking device instruments including (not limited to) inside and outside micrometers, vernier height gauges or indicators, gauge blocks, and pin gauges, to ensure that the tolerances and dimensions of the milled work piece conform to the engineering drawings and job specifications PC53. Complete work documentation including (not limited to) tracking sheets, sign-off sheets, inspection reports or procedure sheets to record the finalization of jobs and to facilitate traceability of work-in-process, ensuring that all data is recorded accurately and clearly in accordance with engineering drawings, job specifications, and company standards/procedures PC54. Practice good housekeeping in the workplace by cleaning up spills or leaks, keeping work area clean and clear of obstructions, and storing tools or equipment, so that that potential for accident or injury is prevented and tools or equipment are in place and available in compliance with company standards/procedures
Knowledge and Understanding (K) w.r.t. the scope	
A. **Regulatory context (knowledge of safety guidelines specified by Director General of Mine Safety (DGMS))**	The user/individual on the job needs to know and understand: KA1. Different types of mines and detail of the mine he is working in KA2. Mine Organisation, time keeping, need for discipline and punctuality KA3. Benching in quarries, Dressing of overhangs, Undercuts, Fencing, First aid and Hygiene KA4. Standing orders in force at the mine. Safety in the vicinity of machinery KA5. Shot-firing and Safety regulations. How and where to take shelter KA6. Duties of workmen KA7. Provision of wages, working hours and accident compensation as per Mines act KA8. Knowledge of mining safety procedures KA9. Impact of violation of safely procedures
B. Organisational	The user/individual on the job needs to know and understand:

Context (Knowledge of the Company/ Organisation and its processes)	KB1. relevant standards and procedures followed in the company KB2. Process flow/ routing of various components
C. Technical Knowledge	The user/individual on the job needs to know and understand: KC1. Operation and mechanism of Drilling Machine, Power Saw, Lathe, Milling Machine, Grinders and abrasives, Boring Mills and their specific usage KC2. Perform calculations using formulas involving ratios, conversions, algebra, basic geometry and trigonometry to solve problems with tapers, dovetails and layout procedures (chords) KC3. Describe, use and interpret information from calipers and gauges (thread, plug, taper, snap and ring etc.) and digital type measuring instruments KC4. Identify geometric dimensions, fits and tolerances (e.g. Concentricity, roundness, angularity, flatness, perpendicularity, runouts, datums etc.) KC5. Understand and describe characteristics of different types of ferrous, non-ferrous metals and alloys (wear resistance, weight, flexibility, hardness, toughness, machinability, etc.) KC6. Sequence of milling operations, and planning the operation sequence (e.g. square up block, key seating, helical, Spline etc.) KC7. Threads (unified, metric, acme, pipe, non-standard etc., including angle, pitch, lead etc. for each type of thread) , methods of threading (internal, tapping, tapered, offset etc.), calculating cutting and measuring threads on a lathe machine KC8. Selecting, installing and removing cutting tools and holders KC9. Setting speeds and feeds by calculating as per the feed/speed chart to account for material type, cutter type, cutter size, rigidity and power of the machine KC10. Purpose and usage of cutting fluids (e.g. lubrication, cooling, chip removal, tool life etc.) KC11. Selecting types of cutting fluids for specific applications (straight oils, soluble oils, semi-synthetic, synthetic etc.

Skills (S) w.r.t. the scope	
A. Core Skills/ Generic Skills	**Writing skills**
	The user/ individual on the job needs to know and understand how to: SA1. Write basic level notes and observations SA2. Draw basic level geometrical /mechanical drawings and charts
	Reading skills
	SA3. Read and interpret workplace related documentation SA4. Read and interpret engineering drawings and sketches
	Oral Communication (Listening and Speaking skills)
	SA5. Discuss task lists and job requirements with co-workers SA6. Effectively communicate information to team members SA7. Discuss with supervisor in order to understand the nature of the problem SA8. Attentively listen with full attention and comprehend the information given by the speaker
B. Professional Skills	**Problem Solving and Decision making**
	The user/individual on the job needs to know and understand how to: SB1. Judge when to ask for help from a supervisor SB2. Suggest options in case any issue is observed during operations
	Plan and Organise
	SB3. Plan work assigned on a daily basis and provide estimates of time required for each piece of work SB4. Prioritize actions to achieve required outcomes
	Analytical thinking
	SB5. Analyse the complexity of work to determine if it can be successfully carried out. SB6. Analyse the causes for defects e.g. if it is related to the cutting tool, machine, fixture.

NOS Version Control

NOS Code	MIN/ N0469		
Credits(NSQF)	TBD	Version number	1.0
Industry	Mining	Drafted on	15/12/2014
Industry Sub-sector	Underground and Open Cast Mines	Last reviewed on	24/03/2015
Occupation	Mechanical Maintenance	Next review date	24/03/2017



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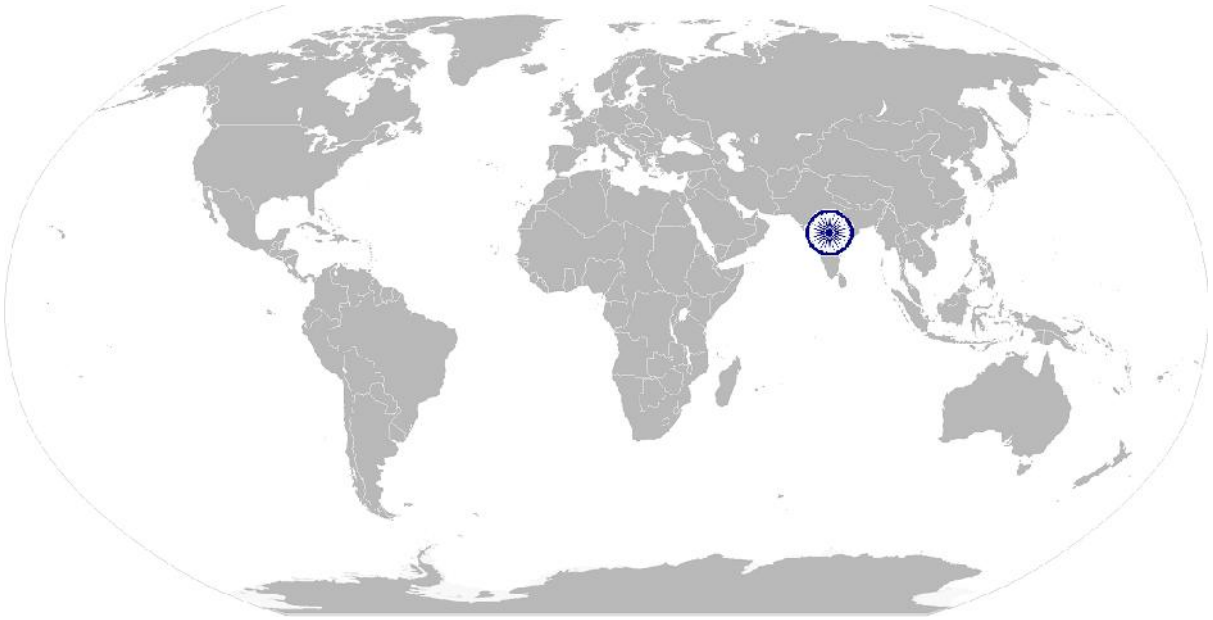
National Occupational Standard



Overview

This unit is about completing all post machining activities and give appropriate feedback to next process.

National Occupational Standard

Unit Code	MIN/ N0470
Unit Title (Task)	**Conduct all post machining operations**
Description	This NOS unit is about conducting all post machining operations such performing minor maintenance, tool change operations, de burring and gauging activities
Scope	This unit/task covers the following: • Perform minor machine maintenance activities • Perform de- burring activity on the machined components • Check quality of machined component (Gauging) • Tool control/ change process
Performance Criteria (PC) w.r.t. the Scope ;;	
Element	**Performance Criteria**
A. Perform minor machine maintenance activities	PC1. Maintain the machine as per routine / daily maintenance check list. Perform minor machine maintenance activities such as oiling or cleaning machine and its components PC2. Adding coolant and lubricant in machine reservoir PC3. Getting the chips removed and sent to the disposal area
B. Perform de-burring activity on the machined components	PC4. With the help of the correct tool remove the extra burrs, sharp edges, rust and chips from the metal surface PC5. Use files, hand grinders, wire brushes, or power tools for performing de burring operations. Ensure usage of Personal Protective equipments like eye glasses and hand gloves. PC6. For automated processes perform shot blasting/ vibro processes for completing de-burring operations
C. Check quality of machined component (Gauging)	PC7. Measure the specifications of the finished component and verify conformance as per CP/ WI PC8. Use devices like micrometers, vernier calipers, gauges, rulers and any other inspection equipment for measuring specifications with valid calibration status. PC9. N ote down the observations of the basic inspection process and identify pieces which comply with the specified standard

	PC10. Separate the defective pieces into two categories – pieces which can be repaired/ modified and pieces which are beyond repair and maintain records of each category
D. Tool control/change process	PC11. Organize changing different worn machine accessories, such as cutting tools (as per tool life listed, recommended) and brushes, other hand tools PC12. Replace machine part as per work instructions, using hand tools or notify supervisor/ engineering personnel for taking corrective actions PC13. For automated process observe the tool change cycle in order to ensure that the selected tool is transferred to the spindle from magazine after the previous tool is transferred to the magazine from the spindle PC14. Store after preservation the die/ tools removed from the machine after change –over for the type of part .
Knowledge and Understanding (K) w.r.t. the scope	
A**. Regulatory context (knowledge of safety guidelines specified by Director General of Mine Safety (DGMS))**	The user/individual on the job needs to know and understand: KA1. Different types of mines and detail of the mine he is working in KA2. Mine Organisation, time keeping, need for discipline and punctuality KA3. Benching in quarries, Dressing of overhangs, Undercuts, Fencing, First aid and Hygiene KA4. Standing orders in force at the mine. Safety in the vicinity of machinery KA5. Shot-firing and Safety regulations. How and where to take shelter KA6. Duties of workmen KA7. Provision of wages, working hours and accident compensation as per Mines act KA8. Knowledge of mining safety procedures KA9. Impact of violation of safely procedures
B. Organisational Context (Knowledge of the Company/ Organisation and its processes)	The user/individual on the job needs to know and understand: KB1. R elevant standards and procedures followed in the company
C. Technical Knowledge	The user/individual on the job needs to know and understand: KC1. Different types of machining processes

	KC2. Different types of tools used in the machining process and de-burring process KC3. Basic principles of 5 S in manufacturing – Cleaning, sorting KC4. The application of coolant and lubricants KC5. Basic Arithmetic and calculation methods for tolerance limits
Skills (S) w.r.t. the scope	
A. Core Skills/ Generic Skills	**Writing skills**
	The user/ individual on the job needs to know and understand how to: SA1. Write basic level notes and observations SA2. Draw basic level geometrical /mechanical drawings and charts
	Reading skills
	SA3. Read and interpret workplace related documentation SA4. Read and interpret engineering drawings and sketches
	Oral Communication (Listening and Speaking skills)
	SA5. Discuss task lists and job requirements with co-workers SA6. Effectively communicate information to team members SA7. Discuss with supervisor in order to understand the nature of the problem SA8. Attentively listen with full attention and comprehend the information given by the speaker
ssional Skills	**Problem Solving and Decision making**
	The user/individual on the job needs to know and understand how to: SB1. Judge when to ask for help from a supervisor SB2. Suggest options in case any issue is observed during operations
	Plan and Organise
	SB3. Plan work assigned on a daily basis and provide estimates of time required for each piece of work SB4. Prioritize actions to achieve required outcomes
	Analytical thinking
	SB5. analyse the complexity of work to determine if it can be successfully carried out. SB6. analyse the causes for defects e.g. if it is related to the cutting tool, machine, fixture.

NOS Version Control

NOS Code	**MIN/ N0470**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Industry	**Mining**	**Drafted on**	15/12/2014
Industry Sub-sector	**Underground and Open Cast Mines**	**Last reviewed on**	**24/03/2015**
Occupation	**Mechanical Maintenance**	**Next review date**	**24/03/2017**

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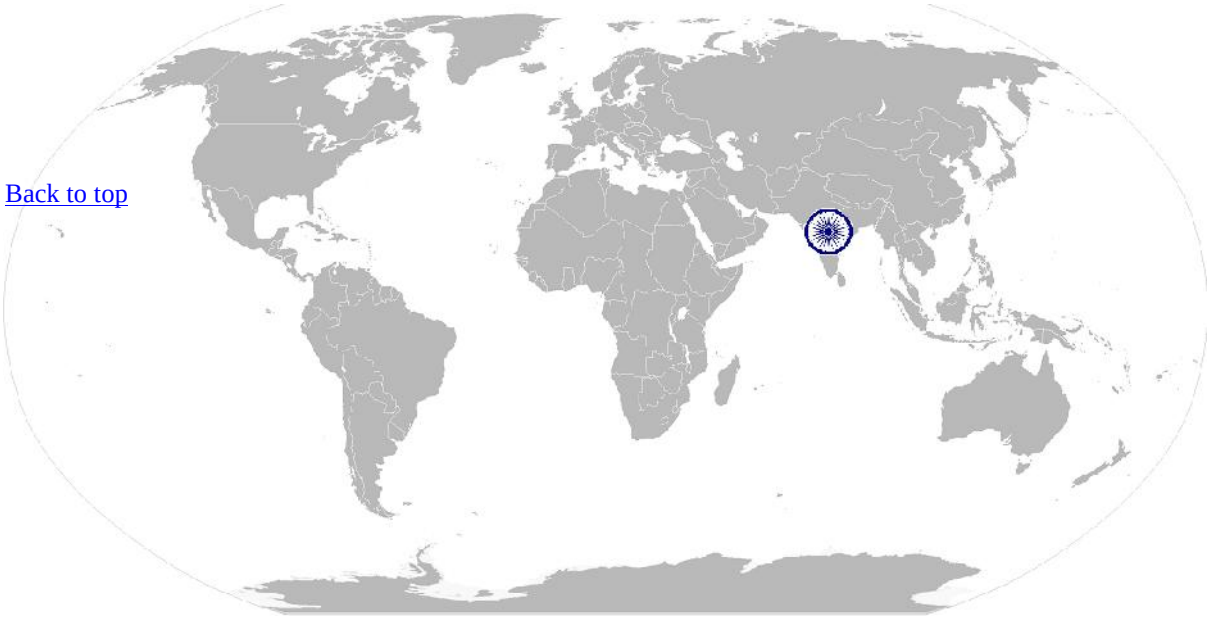
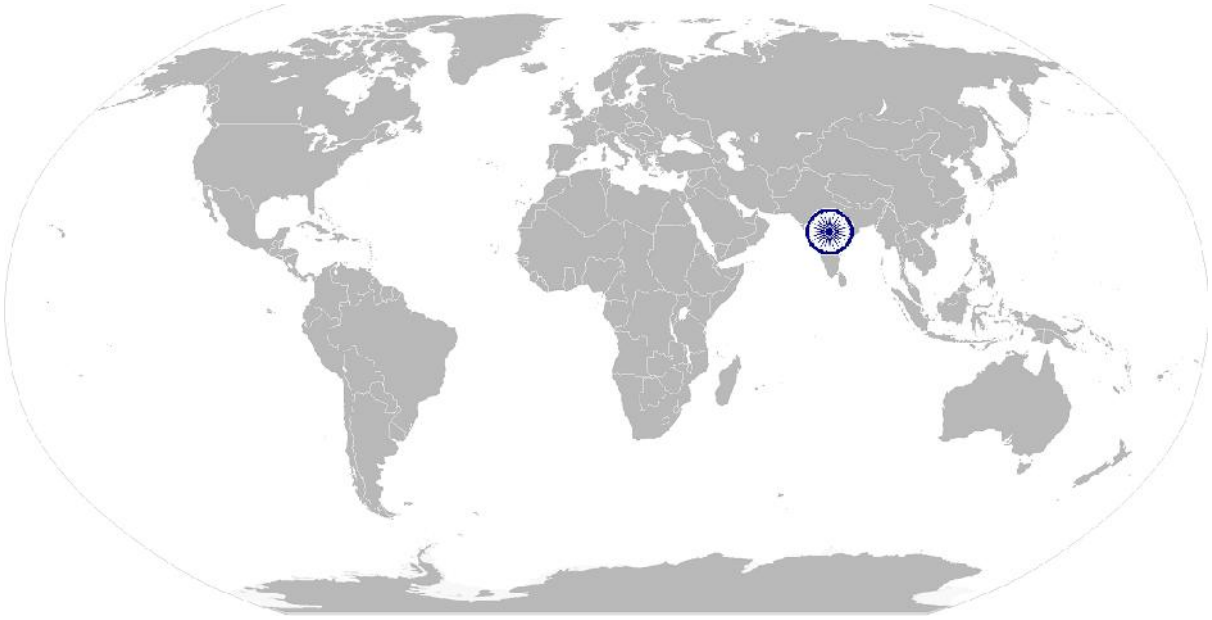


National Occupational Standard



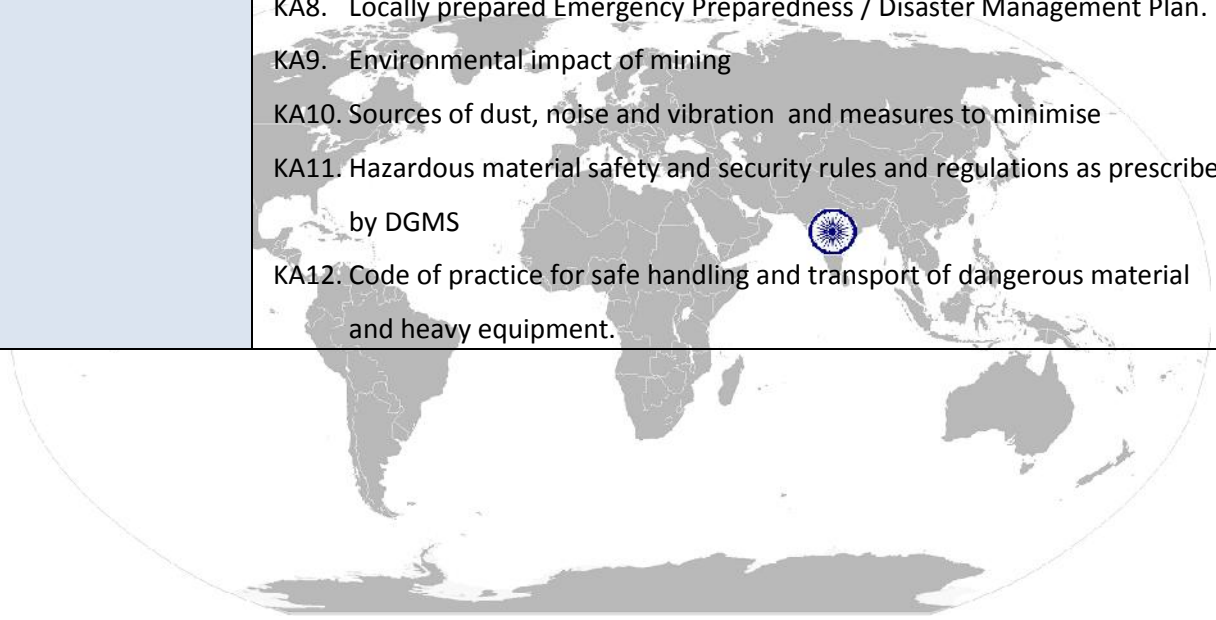
Overview

This unit is about health and safety measures critical in mines

National Occupational Standard

Unit Code	MIN/N 0901
Unit Title (Task)	**Health and Safety**
Description	This unit is about health and safety measures critical in mines
Scope	This OS unit/task covers the following: • Health and safety measures critical in mines
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Safety, Security and Administrative	To be competent, the user/individual on the job must be able to: PC1. Comply with occupational health and safety regulations adopted by the employer. PC2. Follow mining operations procedures with respect to materials handling and accidents PC3. Follow the correct safety steps in case of accident or major failure PC4. Comply with safety regulations and procedures in case of fire hazard. PC5. Operate various grades of fire extinguishers. PC6. Work responsibly and as safe and careful as possible so as not to put the health and safety of self or others at risk, including members of the public PC7. Perform storage and transport of hazardous materials compliant with safety guidelines prescribed by DGMS. PC8. Deal with misfires as per statutory requirement PC9. Identify characteristics of post-blast fumes and take necessary precautions. PC10. Wears safety gear such as hard hat, respiratory protection, eye protection, ear protection PC11. Follow the manufacturer's instructions for care and safe operation of the equipment.

Knowledge and Understanding (K)	
A. **Regulatory context (knowledge of safety guidelines specified by Director General of Mine Safety (DGMS))**	The user/individual on the job needs to know and understand: KA1. Benching in quarries, Dressing of overhangs, undercuts, Fencing KA2. First aid and Hygiene KA3. Code of traffic in specific areas of mine. Significance of fences KA4. Standing orders in force at the mine. Safety in the vicinity of machinery KA5. Shot-firing and Safety regulations. How and where to take shelter KA6. Knowledge of mining safety procedures KA7. Impact of violation of safety procedures KA8. Locally prepared Emergency Preparedness / Disaster Management Plan. KA9. Environmental impact of mining KA10. Sources of dust, noise and vibration and measures to minimise KA11. Hazardous material safety and security rules and regulations as prescribed by DGMS KA12. Code of practice for safe handling and transport of dangerous material and heavy equipment.



NOS Version Control

NOS Code	MIN/N 0901		
Credits(NSQF)	TBD	Version number	1.0
Sector	Mining	Drafted on	15/12/2014
Sub-sector	Underground and Open Cast Mines	Last reviewed on	24/03/2015
Occupation	Mechanical Maintenance	Next review date	24/03/2017

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CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role Mining Machinist

Qualification Pack MIN/Q 0424

Sector Skill Council Mining

Guidelines for Assessment

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC
3. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below)
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria
5. To pass the Qualification Pack , every trainee should score a minimum of 70% in every NOS
6. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack

				Marks Allocation	
		Total Mark (100)	Out Of	Theory	Skills Practical
1.MIN/N0468(Prepare for machining operations)	PC1. Read and interpret engineering drawings, sketches or sample work piece to identify dimensions and tolerances, machine surface designations and allowances, type and features of work piece material	**25**	2	1	1
	PC2. Read and interpret work-process documentation to identify required machines, job operation, sequencing of job, method of machining and set-ups		2	1	1
	PC3. Perform calculations for machining operations including determining speeds and feeds, calculating cutting tool positions, checking work piece alignments, and calculating dimensions to be measured and verified		2	1	1
	PC4. Identify and select machines including conventional and numerically controlled saws, drills, lathes, grinders, and vertical or horizontal mills, using information from engineering drawings and work process documentation, to ensure that the machine selected is the correct one for the application and available to perform the job		3	2	1

	PC5. Identify and select cutting fluids using manuals, charts, engineering drawings, and material safety data sheets, ensuring that the cutting fluid selected is the correct one to maximize machining without damage to work piece, cutting tool, or machine		3	1	2
	PC6. Identify and select tooling required to cut the work piece by using information in engineering drawings and job instructions		3	2	1
	PC7. Identify and prepare cutting tools by sharpening or replacing tools so that the cutting shape and angle are prepared for optimum cutting and personal safety in accordance with manufacturer's specifications, engineering drawings, sketches, sample work piece and company standards/procedures		2	1	1
	PC8. Identify and check machine controls and systems including locating and identifying switches, buttons, levers, controls, and safety devices, to ensure that all controls are operational and functioning		2	1	1
	PC9. Verify work piece material for correct size and type by checking codes, lettering, or numerical stamps to ensure that the work piece selected conforms to job instruction specification		2	1	1
	PC10. Identify and select measuring instruments and checking devices, ensuring that instruments and devices selected are capable of measuring to obtain the dimensions and tolerances specified as per the job specifications		2	1	1
	PC11. Select machine speeds and feeds using speed and feed charts and in accordance with size, type, and hardness of work piece materials		2	1	1
		Total	**25**	**13**	**12**
2. MIN/N0469:(Perform machining operations)	PC1. Check straight cuts by using precision measuring instruments including (not limited to)micrometer, verniers, callipers, squares, straight edge, dial indicator, and surface comparator, to ensure that the accurate size, finish, parallelism, and squareness of straight cuts conform with job specifications	**25**	0.5	0.35	0.15
	PC2. Check shapes by using precision measuring instruments and checking devices including(not limited to) radius gauges, surface comparator, and verniers, to ensure that the profile and finish of the cut shape conform to		0.5	0.35	0.15

	engineering drawing and job specifications				

	PC3. Check threads by using precision measuring instruments, checking devices, and various checking methods including (not limited to) 3-wire method, thread micrometer, thread gauge, and plug or ring gauges, to ensure that the accuracy of pitch, thread geometry, and size of cut threads conform to job specifications		0.5	0.35	0.15
	PC4. Check holes by using precision measuring instruments and checking devices including(not limited to) dial indicators, bore gauges, plug gauges, telescopic gauges, surface comparators, and vernier, to ensure that the accuracy of the diameter, depth, concentricity, position, and finish of cut holes conform with engineering drawings and job specifications		0.5	0.35	0.15
	PC5. Check tapers using precision measuring instruments and checking devices including (not limited to) taper gauge, sine bar, micrometer, and vernier to ensure that the accuracy of the angle, taper/foot, and diameter of the cut tapers conform with engineering drawings and job specifications		0.5	0.35	0.15
	PC6. Check hardness using various types of hardness testers and comparison charts to ensure that the hardness level of the work piece materials conforms with engineering drawings and job specifications		0.5	0.35	0.15
	PC7. Hand-file using files including (not limited to) flat, needle, rat-tail, lathe, and half-round files to remove excessive material so that work piece is filed		0.5	0.35	0.15
	PC8. Hand-saw using cut-off saws to cut work piece to specified lengths in accordance with job specifications		0.5	0.35	0.15
	PC9. Hand-drill holes using power drill and drill bits so that the size of the drilled hole conform with job specifications		0.5	0.35	0.15
	PC10. Hand-grind using pneumatic or electric hand grinders to remove excess material, so that the work piece is ground in accordance with job specifications		0.5	0.35	0.15
	PC11. Check fused/welded blade to ensure that joined saw has a continuous cutting edge in accordance with manufacturer's or job specifications		0.5	0.35	0.15

	PC12. Lay out features of engineering drawings on to the work piece using precision measuring instruments and layout equipment including (not limited to) scriber, center, punch, vernier height gauge, surface plate, combination set, and layout medium or dyes	0.5	0.35	0.15
	PC13. Locate and position work piece in saw to required operational clearances by setting up work holding devices including (not limited to) clamps, nesting fixtures, vises, or roller supports, so that the work piece is aligned, secured, and stable during sawing operations	0.5	0.35	0.15
	PC14. Select speeds and feeds of saws using speed and feed charts and in accordance with the size, type, and hardness of work piece material, so that the saw performs optimum cutting without damage to work piece, cutting tools, or machines, and ensures personal safety	0.5	0.35	0.15
	PC15. Install and test-run blade to check alignments and movements, so that the blade is installed to make the required cut, prevents machine or blade damage, and ensures personal safety	0.5	0.35	0.15
	PC16. Check first cut-off by measuring and checking a cut-off piece, to ensure that the angles, squareness, and length of the sawed piece conform to job specifications	0.5	0.35	0.15
	PC17. Cut shapes using a vertical band saw using required sawing sequences, speeds, feeds, and cutting fluids, so that the profile, size, and dimensions of the cut shapes conform to job specifications	0.5	0.35	0.15
	PC18. Deburr work piece using files, scrapers, emery cloth, sanders, and hand or pedestal grinders, to remove excess material and to ensure safe handling	0.5	0.35	0.15
	PC19. Perform final inspection using precision measuring instruments and checking devices including (not limited to) inside and outside micrometers, vernier height gauges or indicators, gauge blocks, and pin gauges, to ensure that the tolerances and dimensions of the sawed work piece conform to the engineering drawings and job specifications	0.5	0.35	0.15
	PC20. Select drill tooling including drill bits, center-drill, reamers, taps, counter-bores, counter sinks, and spot-faces by using information in engineering drawings and job	0.5	0.35	0.15

	specifications to ensure that tooling is the correct size, shape, type, and grade for the application			
	PC21. Identify and prepare cutting tools for drills by sharpening or replacing tools, so that the cutting shape and angle is prepared for optimum cutting and personal safety	0.5	0.35	0.15
	PC22. Locate and position work piece in drill to required operational clearances by setting up and securing work piece with work holding devices including (not limited to) drilling vises, clamps, jigs, angle plates, and chucks, so that the work piece is aligned, secured, and stable during drilling in accordance with job specifications	0.5	0.35	0.15
	PC23. Set up tooling in drills to required operational alignments using holding devices including (not limited to) drill chucks, taper sleeves, and tapping heads, to ensure that tooling is in position and held securely during drilling	0.5	0.35	0.15
	PC24. Select speeds and feeds of drill using speed and feed charts and in accordance with the size, type, and hardness of work piece material, so that the drill performs optimum cutting without damage to work piece, cutting tools, or machines, and ensures personal safety	0.5	0.35	0.15
	PC25. Centre-drill a layout punch mark using a drill press/machine, chuck, centre-drill, and cutting fluid, so that the punch mark is drilled in accordance with job specifications	0.5	0.35	0.15
	PC26. Drill a hole using a drilling machine, drill bits, and cutting fluids, so that the size and depth of drilled hole conform to job specifications	0.5	0.35	0.15
	PC27. Chamfer/ Ream a hole using a drilling machine, countersinks, reamers and cutting fluids to break sharp edges/ and to produce a reamed hole	0.5	0.35	0.15
	PC28. Perform counter-boring/counter-sinking using a drilling machine, countersinks, and cutting fluids to conform to job specifications	0.5	0.35	0.15
	PC29. Select lathe cutting tools including (not limited to) drill bits, boring, parting, threading, facing, or turning tools, by using information from engineering drawings and jobinstructions	0.5	0.35	0.15

	PC30. Identify and prepare lathe cutting tools by sharpening or replacing, so thatcuttingshape & angle is prepared for optimum cutting efficiency& safety	0.5	0.35	0.15
	PC31. Locate and position wor kpiece in lathe to required operational clearances by setting up and securing work holding devices including (not limited to) chucks, face plates, centres, catch plates, steady rest, or tail stock, so that the work piece is aligned, secured, and stable	0.5	0.35	0.15
	PC32. Set up lathe cutting tools to required operational alignments using tool posts and tailstocks, to ensure that tools are in position and held securely	0.5	0.35	0.15
	PC33. Select speeds and feeds of lathe using speed and feed charts and in accordance with the size, type, and hardness of work piece material, so that the lathe performs optimum cutting without damage to workpiece, cutting tools, or machine and ensures personal safety	0.5	0.35	0.15
	PC34. Take a sizing (preliminary) cut to determine reference workface and to check speeds and feeds to ensure that lathe is set up	0.5	0.35	0.15
	PC35. Establish a reference or starting point (datum) by zeroing out machine and ensuring that the datum is correctly located	0.5	0.35	0.15
	PC36. Face a surface using a lathe and single-point tool bit and by measuring or checking with vernier, straight edge, or micrometer, so that the surface flatness and finished edge conform to engineering drawings and job specifications	0.5	0.35	0.15
	PC37. Turn an external diameter using a lathe and single-point tool and by measuring or checking with a vernier or micrometer, so that the turned diameter conforms to engineering drawings and job specifications	0.25	0.25	0
	PC38. Drill a hole using a lathe, centre-drill, drills, and tailstock, so that the diameter and depth of the drilled hole conform to job specifications	0.5	0.35	0.15
	PC39. Bore an internal diameter using a lathe and boring bars mounted in a tool post, so that the close-tolerance internal diameters conform to engineering drawings and job specifications	0.25	0.25	0

	PC40. Ream a hole using a lathe, centre-drill, drills, reamers, and tail-stock, and by measuring or checking with vernier, micrometer, and gauges	0.5	0.35	0.15
	PC41. Tap a hole using on lathe, taps, tapping head, and tailstock, so that the depth, diameter, and thread pitch of the tapped hole are as per the desired specifications	0.5	0.35	0.15
	PC42. Turn an internal or external thread using a lathe and single-point tool bit and by measuring or checking with thread micrometers and thread plug gauge (go-no-go)	0.5	0.35	0.15
	PC43. Produce a taper using a lathe, offset tail stock, taper-turning attachment, and compound rest, and by measuring or checking with protractors, micrometers,	0.5	0.35	0.15
	PC44. Select milling cutting tools including (not limited to) end mills, face mills, shell cutters, slot drills, boring bars, slitting saws, and boring head	0.5	0.35	0.15
	PC45. Identify and prepare milling cutting tools by sharpening or replacing tools so that the cutting shape and angle is prepared for optimum cutting and personal safety	0.25	0.25	0
	PC46. Set-up and maintain milling adjustable support tools including (not limited to) indexing heads, vises, angle plates, sine bars, and tables, ensuring that the support tool is the correct one for the application and the work piece is located and secured during machining	0.25	0.25	0
	PC47. Set-up milling cutting tools to required operational alignments using arbours, collets, and drill chucks, to ensure the tools are in position and held securely during machining	0.5	0.35	0.15
	PC48. Select speeds and feeds of mill using speed and feed charts and in accordance with the size, type, and hardness of work piece material, so that the mill performs optimum cutting without damage to work piece, cutting tools, or machine and ensures personal safety	0.25	0.25	0
	PC49. Face-mill using a milling machine, multi-point tool bit, face mill, and required cutting fluids, so that the size, shape, squareness, and flatness of the faced workpiece conform to engineering drawings and job specifications	0.5	0.35	0.15

	PC50. Machine steps, cut-outs, angles, and open slots using a milling machine, end mill, and required cutting fluid, so that the size, shape, and angle of the end-milled work piece conform to engineering drawings and job specifications		0.5	0.35	0.15
	PC51. Deburr work piece using files, scrapers, emery cloth, sanders, and hand or pedestal grinders to remove excess material and to ensure safe handling in accordance with engineering drawings, job specifications		0.25	0.25	0
	PC52. Perform final inspection using precision measuring instruments and checking device instruments including (not limited to) inside and outside micrometers, vernier height gauges or indicators, gauge blocks, and pin gauges, to ensure that the tolerances and dimensions of the milled work piece conform to the engineering drawings and job specifications		0.5	0.25	0.25
	PC53. Complete work documentation including (not limited to) tracking sheets, sign-off sheets, inspection reports or procedure sheets to record the finalization of jobs and to facilitate traceability of work-in-process, ensuring that all data is recorded accurately and clearly in accordance with engineering drawings, job specifications, and company standards/procedures		0.25	0.25	0
	PC54. Practice good housekeeping in the workplace by cleaning up spills or leaks, keeping work area clean and clear of obstructions, and storing tools or equipment, so that that potential for accident or injury is prevented and tools or equipment are in place and available in compliance with company standards/procedures		0.25	0.25	0
		Total	**25**	**18**	**7**
3. MIN/N0470:(Conducting all post machining operations)	PC1. Maintain the machine as per routine/daily maintenance check list. Perform min or machine maintenance activities such as oiling or cleaning machine and its components	**25**	2	1	1
	PC2. Adding coolant and lubricant in machine reservoir		2	1	1
	PC3. Getting the chips removed and sent to the disposal area		2	1	1
	PC4. With the help of the correct tool remove the extra burrs, sharp edges, rust and chips from the metal surface		2	1	1

	PC5. Use files, hand grinders, wire brushes, or power tools for performing de burring operations. Ensure usage of Personal Protective equipment's like eye glasses and hand gloves.		2	1	1
	PC6. For automated processes performs hot blasting/vibe processes for completing- burring operations		2	1	1
	PC7. Measure the specifications of the finished component and verify conformance as per CP/WI		2	1	1
	PC8. Use devices like micrometers, vernier calipers, gauges, rulers and any other inspection equipment for measuring specifications with valid calibration status.		2	1	1
	PC9. Note down the observations of the basic inspection process and identify pieces which comply with the specified standard		1	1	0
	PC10.Separatethe defective pieces into two categories–pieces which can be paired/ modified and pieces which are be yond repair and maintain records of each category		1	1	0
	PC11.Organize changing different worn machine accessories, such as cutting tools(as per tool life listed, recommended) and brushes, other hand tools		1	1	0
	PC12.Replacemachinepart as per work instructions, using hand tools or notify supervisor/ engineering personnel for taking corrective actions		2	1	1
	PC13.For automated process observe the tool change cycle in order to ensure that the selected tool is transferred to the spindle from magazine after the previous tool is transferred to the magazine from the spindle		2	1	1
	PC14.Storeafterpreservationthedie/tools removed from the machine after change–over for the type of part.		2	1	1
		Total	**25**	**14**	**11**
4. MIN/ N0901 (Health and Safety)	PC1. Comply with occupational health and safety regulations adopted by the employer.	**25**	2	1	1
	PC2. Follow mining operations procedures with respect to materials handling and accidents		3	2	1
	PC3. Follow the correct safety steps in case of accident or major failure		2	1	1
	PC4. Comply with safety regulations and procedures in case of fire hazard.		2	1	1
	PC5. Operate various grades of fire extinguishers.		3	2	1

	PC6. Work responsibly and as safe and careful as possible so as not to put the health and safety of self or others at risk, including members of the public		2	1	1
	PC7. Perform storage and transport of hazardous materials compliant with safety guidelines prescribed by DGMS.		3	2	1
	PC8. Deal with misfires as per statutory requirement		2	1.5	0.5
	PC9. Identify characteristics of post-blast fumes and take necessary precautions.		2	1.5	0.5
	PC10. Wears safety gear such as hard hat, respiratory protection, eye protection, ear protection		2	1	1
	PC11. Follow the manufacturer's instructions for care and safe operation of the equipment.		2	1	1
		Total	**25**	**15**	**10**