QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR CAPITAL GOODS INDUSTRY

Contents

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 standards that individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding

Contact Us:
Capital Goods Skill Council, FICCI,
Federation House,
Tansen Marg,
New Delhi 110 001

E-mail:
inder.gahlaut@ficci.com

Introduction

Qualifications Pack: CNC Setter cum Operator - Vertical Machining Centre

SECTOR: CAPITAL GOODS

SUB-SECTOR:

1. Machine Tools
2. Dies, Moulds and Press Tools
3. Plastics Manufacturing Machinery
4. Textile Manufacturing Machinery
5. Process Plant Machinery
6. Electrical and Power Machinery
7. Light Engineering

OCCUPATION: Machining

REFERENCE ID: CSC/ Q 0123

ALIGNED TO : NCO-2004/7223.40

CNC Setter cum Operator - Vertical Machining Centre: Setting of computer numerically controlled (CNC) vertical machining machines (VMC) in order to perform machining operations on metal components, as per specifications provided.

Brief Job Description: It involves setting up cutting tools and workholding devices for producing components that combine a number of different features, conducting trial runs, proving the program tool by tool in single block mode, performing the necessary checks before allowing the machine to operate in full program run mode and then handing over for production.

Personal Attributes: Basic communication, numerical and computational abilities. Openness to learning, ability to plan and organize own work and identify and solve problems in the course of working. Understanding the need to take initiative and manage self and work to improve efficiency and effectiveness

Job Details

Qualifications Pack Code	**CSC/ Q 0123**		
Job Role	**CNC Setter cum Operator - Vertical Machining Centre**		
Credits (NSQF)	**TBD**	**Version number**	**1.0**
Sector	**CAPITAL GOODS**	**Drafted on**	**14/04/14**
Sub-sector	1. Machine Tools 2. Dies, Moulds And Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering Goods	**Last reviewed on**	**18/03/15**
Occupation	**MACHINING**	**Next review date**	**30/08/16**
NSQC Clearance on	**26/03/2015**		

Job Role	CNC Setter cum Operator – Vertical Machining Centre
Role Description	Setting of computer numerically controlled (CNC) vertical machining machines (VMC) in order to perform machining operations on metal components, as per specifications provided.
NSQF level	5
Minimum Educational Qualifications	10th Standard
Maximum Educational Qualifications	N.A.
Training (Suggested but not mandatory)	No Previous Training Required
Minimum Job Entry Age	18 Years Old
Experience	Minimum 1 year as an Vertical Machine Operator
Applicable National Occupational Standards (NOS)	**Compulsory:** 1. CSC/ N 0123: Set computer numerically controlled vertical machining center to perform a range of operations on metal components 2. CSC/ N 0116: Perform a range of operations on metal components using computer numerical controlled vertical machining center 3. CSC/ N 1335: Use basic health and safety practices at the workplace 4. CSC/ N 1336: Work effectively with others **Optional:** N.A.
Performance Criteria	As described in the relevant OS units

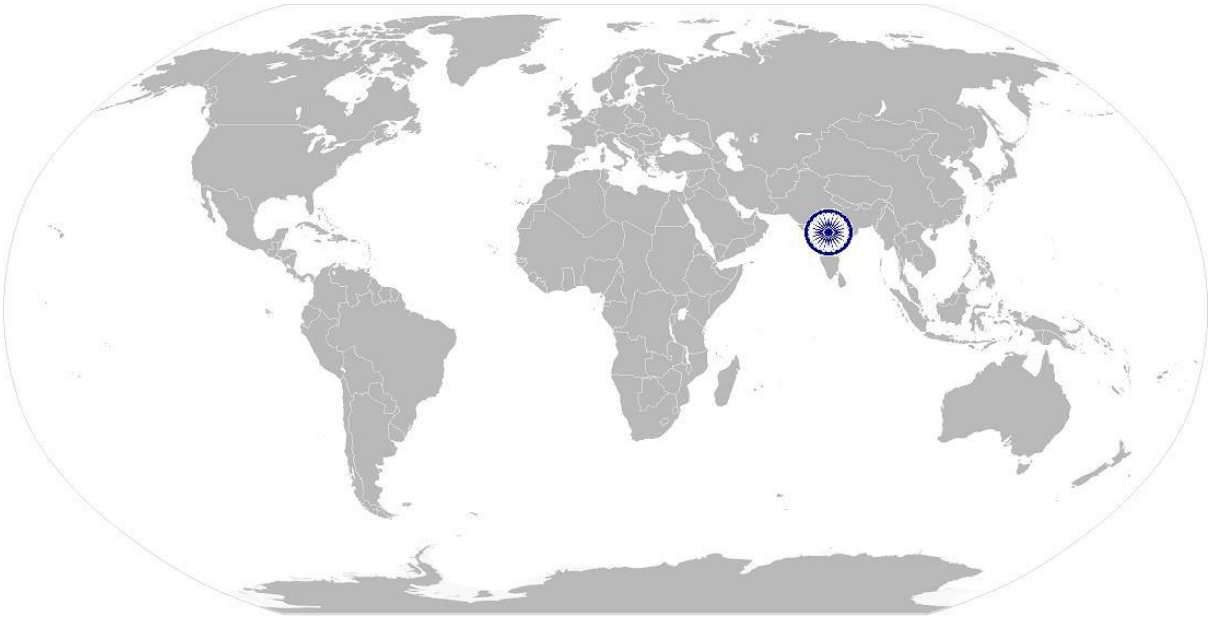
Definitions

Keywords /Terms	Description
Core Skills/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 NOS, these include communication related skills that are applicable to most job roles.
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 NOS.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organization.
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.
National Occupational Standards (NOS)	NOS are Occupational Standards which apply uniquely in the Indian context
Occupation	Occupation is a set of job roles, which perform similar/related set of functions in an industry.
Organisational Context	Organisational 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.
Performance Criteria	Performance Criteria are statements that together specify the standard of performance required when carrying out a task.
Qualifications Pack(QP)	Qualifications Pack comprises the set of NOS, together with the educational, training and other criteria required to perform a job role. A Qualifications Pack is assigned a unique qualification pack code.
Qualifications Pack Code	Qualifications Pack Code is a unique reference code that identifies a qualifications pack.
Scope	Scope is the set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on the quality of performance required.
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.
Sub-functions	Sub-functions are sub-activities essential to fulfil the achieving the objectives of the function.
Technical Knowledge	Technical Knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Unit Code	Unit Code is a unique identifier for a NOS unit, which can be denoted with an 'N'
Unit Title	Unit Title gives a clear overall statement about what the incumbent should be able to do.
Vertical	Vertical may exist within a sub-sector representing different domain areas or the client industries served by the industry.

Acronyms

Keywords /Terms	Description
CNC	Computer Numerically Controlled
VMC	Vertical Machining Center
3 D	3 dimensional
CAD	Computer Aided Design
CAM	Computer Aided Manufacture
DTI	Dial test indicators
HCS	High Carbon Steel
CO2	Carbon dioxide
CPR	Cardiac pulmonary resuscitation
PPE	Personal protective equipment

National Occupational Standard



Overview

This unit covers the setting of computer numerically controlled (CNC) vertical machining machines (VMC) in order to perform machining operations on metal components, as per specifications provided.

CSC/ N 0123: Set computer numerically controlled vertical machining center to perform a range of operations on metal components

National Occupational Standard

Unit Code	**CSC / N 0123**
Unit Title (Task)	**Set computer numerically controlled vertical machining center to perform a range of operations on metal components**
Description	This unit covers the etting of Computer Numerically Controlled (CNC) vertical machining center (VMC), in order to perform multiple machining operations on metal components, as per specifications provided. It does not include machine programming. It involves setting the machine for producing components that combine a number of different features, such as flat faces, parallel faces, faces square to each other, faces at an angle, steps/shoulders, open and enclosed slots, drilled, bored and reamed holes, internal and external threads, and special forms/profiles. The candidate will be expected to perform independently as per instructions given, taking personal responsibility for own actions and for the quality and accuracy of the work produced by self, also providing guidance and support to subordinates.
Scope	This unit/task covers the following: • Working safely • Prepare for setting CNC VMC machine • Carry out setting for CNC VMC machine

Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working safely	The user/individual on the job should be able to: PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing VMC setting operations PC3. work following laid down procedures and instructions PC4. ensure work area is clean and safe from hazards PC5. ensure that all tools and equipment are in a safe and usable condition PC6. ensure that the components used are free from foreign objects, dirt or other contamination
Prepare for setting CNC VMC machine	The user/individual on the job should be able to: PC7. obtain job specification from a valid and approved source **Valid sources**: Job or work instruction sheet/card; work drawings and instructions; planning documentation; quality control documents; operation sheets; process specifications; instructions from supervisor PC8. read and establish job requirements from the job specification document accurately **Job specification documents**: detailed component drawings; approved sketches/illustrations; national, international and organizational standards; reference charts, tables and graphs; machining/assembly drawings **Job requirements**: raw materials or components required (type, quality, quantity); dimensions; limits and tolerances; surface texture requirements;

	operations required (list, sequence and procedures where applicable); shape or profiles to be machined; projections (orthographic [first angle, third angle], isometric (including exploded, oblique); reference points, lines, edges and surfaces; continuous dimensions; baseline dimensions; work-holding devices and instruments to be used; cutting tool solutions; tool magazine setup; interdependencies; timelines PC9. report and rectify incorrect and inconsistent information in job specification documents as per organization procedures PC10. prepare the work area for the VMC setting operations as per procedure or specification received PC11. conduct a preliminary check of the readiness of the VMC machine **Preliminary check**: e.g. machine is clean, referencing-zero return, lubrication are functioning, coolant level is correct, sub-systems are working correctly, etc. PC12. conduct a preliminary check of the readiness of the components and cutters PC13. obtain appropriate cutting tools and hand tools and measuring tools as per job requirements **Hand tools**: allen keys, spanner, wrenches, mallet **Cutting tools**: mills (face, end), drills (twist/core, slot), boring tools, reamers, taps, special profile cutters **Cutting tools materials**: high carbon steel (HCS), high speed steel (HSS) tungsten carbide, carbide PC14. ensure that all measuring equipment is calibrated and approved for usage **Measuring equipment**: rules, micrometers (external, internal, depth), verniers (digital, dial; length, depth; protractors), gauges (slip, bore/hole, thread, plug, radius/profile), dial test indicators (DTI), surface finish equipment (such as comparison plates, machines), templates PC15. extract and use information from engineering drawings and relate specifications in relation to work undertaken PC16. use and extract information from reference charts, tables, graphs and standards **Reference charts, tables and graphs:** tapping sizes and threads; feeds and speeds; machining symbols and tolerances PC17. identify tool requirements from tooling layout and assess their suitability for producing various features and profiles **Features and profiles**: faces (flat, square, parallel, angular), steps/shoulders, slots (open ended, enclosed, tee), holes (drilled, bored), forms (profile -vee, concave, convex, gear forms; indexed or rotated; special), recesses, serrations PC18. identify suitable work-holding or fixturing device as per the job requirement PC19. ensure that the tools and fixtures are in usable condition(free from breakage, damage, calibration, etc.) PC20. ensure the correct and latest part-program is uploaded onto the CNC system **Part-programme for relative work/tool movement of a CNC machine tool**: co-ordinate positioning (absolute, incremental); use of sub routines; macros and canned cycles; CAD/CAM; CNC program; post processing; data transfer

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	PC21. pre-set the tooling using setting jigs/fixtures PC22. where appropriate, seek any necessary instruction/training on the operation of the machine
Carry out setting for CNC VMC machine	The user/individual on the job should be able to: PC23. mount and set the required work-holding devices, work-piece and cutting tools **Set up of the machine**: alignment of work-holding device, position of cutters in relationship to work-piece/ tool pre-setter, VMC cutter revs per minute, machine guards/safety mechanisms, linear/table feed rate, cutting fluid flow rate, depth of cut for roughing and finishing PC24. check that the tools have a specific tool number in relation to the operating program PC25. enter all relevant tool data to the operating program on the CNC PC26. set tool datums, positions, lengths, offsets and radius compensation PC27. mount the work-holding device/fixture onto the machine PC28. set the work-holding device/fixture in relationship to the machine datum's and reference points PC29. set the machine tool operating parameters(eg hydraulic pressure, clamping) as per the component requirements PC30. place the machine into the correct operating mode, and access the program edit facility in order to enter tooling data, PC31. conduct trial runs using single block run, dry run and feed and speed override controls PC32. prove the program tool by tool in single block mode PC33. perform the necessary checks before allowing the machine to operate in full program run mode **Checks**: after proving the program, measure the dimensions of the first component on the machine and correct accordingly; unload the component after all the dimensions are as per specifications; inspect the component for all dimensions and record findings in specified formats; make a note of the corrections to be made in the tool wear offsets and correct accordingly; run the next component PC34. check and hand-over the machine after set-up to the machine operator along with relevant instructions and documentation **Checks**: check alignment and levels; check electrical power; supplies/insulation, safety switches/devices; check interlocking, security of pipes and couplings; check oil levels; check, oil temperature, oil pressure, cooling/coolant system at light load and at full load; check if machine functions as required for production PC35. complete relevant documentation as per organizational procedure PC36. handle the typical problems that can occur with the setting up of the tooling, work-holding devices and proving the program PC37. switch the VMC machine on and off in normal and emergency situations PC38. after use, return the old cutting tools, work-holding device, fixtures, instruments, drawings and verified tapes and programs back to store, safely and correctly

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	PC39. ensure that there is no damage to the tool/fixture while doing the prove-out PC40. complete documentation during and post operations and submit as per organizational procedures PC41. deal promptly and effectively with problems within the setter's control, and seek help and guidance from the relevant people, in case of problems that cannot beresolved PC42. shut down the equipment to a safe condition on conclusion of the activities PC43. leave the work area in a safe and tidy condition on completion of the setting activities
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions KA2. relevant health and safety requirements applicable in the work place KA3. importance of working in clean and safe environment KA4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities KA5. reporting structure, inter-dependent functions, lines and procedures in the work area KA6. relevant people and their responsibilities within the work area KA7. escalation matrix and procedures for reporting work and employment related issues KA8. documentation and related procedures applicable in the context of employment and work KA9. importance and purpose of documentation in context of employment and work
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. specific safe working practices, CNC machining procedures and environmental regulations KB2. hazards associated with setting and machining operations on a VMC and how can they be minimised KB3. personal protective equipment to be used during the setting and machining activities on a VMC and where can it be obtained KB4. types and sources of appropriate job specifications **Valid sources**: Job or work instruction sheet/card; work drawings and instructions; planning documentation; quality control documents; operation sheets; process specifications; instructions from supervisor KB5. uses and applications of VMC KB6. common terminology used in VMC KB7. main features and working parts of the VMC machine, and the accessories that can be used KB8. how to read and interpret first and third angle component drawings KB9. how to extract information from engineering drawings or data and related specifications KB10. operating principles of computer numerically controlled machine tools **Operating principles**: open loop system; closed loop system; control systems (closed loop servo motors and associated transmission, stepper motors and

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	associated transmission); types and function of position transducers (rotary type); digital control KB11. importance of following specified machining sequences and procedures KB12. importance of ensuring workpieces/materials and consumables are suitable for the specified job and related procedures KB13. characteristics considered for selection of materials for engineering applications **characteristics**: magnetism, machine ability, application, influence of physical properties of materials on processing techniques(cutting, forming, joining) KB14. importance and procedures to ensure that tools and equipment are in a safe and usable condition KB15. various VMC machining operations that can be performed, and the methods and equipment used KB16. range of workholding methods and devices that are used on VMC KB17. the methods of setting work-holding devices, and the tools and equipment used for it **Equipment used for positioning, aligning and securing**: clamping direct to machine table; pneumatic or magnetic table; machine vice (such as plain, swivel, universal); angle plate; vee block and clamps; fixtures; indexing head/device; rotary table; magnetic chucks KB18. range of cutting tools that are used on VMCs, and their applications **Cutting tools**: mills (face, end), drills (twist/core, slot), boring tools, reamers, taps, special profile cutters **Cutting tools materials**: high carbon steel (HCS), high speed steel (HSS) tungsten carbide, carbide KB19. various tool holding devices that are used, and the methods of correctly mounting and securing the cutting tools to the tool holders KB20. basic principles of operation of the various VMCs, and typical operations that they can perform KB21. how to handle and store VMC cutters safely and correctly KB22. how to extract and use information from engineering drawings and related specifications in relation to work undertaken KB23. the British and metric(SI) systems of measurement KB24. work-piece reference points and system of tolerancing KB25. factors determining selection and use of indexible tips **Factors**: hardness of the material, the cutting characteristics of the material, tolerances to be achieved, component surface finish, component, specifications KB26. factors which determine speeds and feeds to be used KB27. importance of using correct procedures as per raw materials form of supply/ shapes **Raw materials forms of supply/ shapes:** square/rectangular (eg. bar stock, sheet material, machined components), circular/cylindrical (eg. bar stock, tubes, turned components, flat discs), irregular shapes/profile (eg. castings, forgings, odd shaped components) KB28. how the various types of material will affect the feeds and speeds that can be used

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	Types of materials: ferrous metals: e.g. carbon steels, stainless steels, cast iron, tool steel, hard metals; non-ferrous metals: e.g. bronze, aluminium, copper and copper alloys; non-metals: eg. plastics KB29. types of cutting fluid that are used, and precautions to be taken when handling and using them KB30. advantages of using pre-set tooling, and how to set the tooling using setting jigs/fixtures KB31. use of tool posts, magazines and carousels, and how to position and identify the tools in relationship to the operating program KB32. machinability as per the hardness of material. KB33. different kind of inserts for using higher parameters for faster machining KB34. need for clamping the job to avoid distortion where high degree of accuracy is required KB35. types of error messages on the VMC display and how to respond to each KB36. importance of proving the program and how to do it KB37. quality control procedures that are used, inspection checks to be carried out, and the equipment that will need to be used KB38. how to check the quality of the shaped components against the required quality standards **Quality and accuracy standards**: components to be free from false tool cuts, burrs and sharp edges; specific dimensional tolerances within +/- 0.02mm; flatness & squareness within 0.025mm; surface finish 63µin or 1.6µm; angles within +/-15sec; bored holes within H6 KB39. basic maintenance requirements of the machine and process for repair and maintenance KB40. importance of reporting problems in a timely manner KB41. report conditions and seek appropriate assistance in a timely manner to address risk of failure to comply with necessary targets and specifications KB42. deal with finished components as per organizational guidelines KB43. complete documentation during and post operations as per organizational procedures KB44. importance of returning all tools and equipment to the correct location on completion of the setting activities KB45. importance of leaving the work area in a safe and tidy condition on completion of job activities
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Communication (Reading, Writing, Listening and Speaking)**
	The user/ individual on the job needs to know and understand how to: SA1. read and interpret information correctly from various job specification documents, manuals, health and safety instructions, memos, etc. applicable to the job in English and/or local language **Job specification documents**: detailed component drawings; approved sketches/illustrations; national, international and organizational standards; reference charts, tables and graphs; machining/assembly drawings SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language SA3. convey and share technical information clearly using appropriate language

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	SA4. check and clarify task-related information SA5. liaise with appropriate authorities using correct protocol SA6. communicate with people in respectful form and manner in line with organizational protocol
	Numerical and computational skills
	The user/individual on the job needs to know and understand how to: SA7. undertake numerical operations, and calculations/ formulae **Numerical computations**: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages SA8. identify and draw various basic, compound and solid shapes as per dimensions given **Basic shapes**: square, rectangle, triangle, circle **Compound shapes**: involving squares, rectangles, triangles, circles, semi-circles, quadrants of a circle **Solid shapes**: cube, rectangular prism, cylinder SA9. use appropriate measuring techniques and units of measurement SA10. use appropriate units and number systems to express degree of accuracy **Units and number systems representing degree of accuracy**: decimals places, significant figures, fractions as a decimal quantity SA11. interpret and express tolerance in terms of limits on dimensions SA12. calculation of the value of angles in a triangle **Angles in a triangle**: right-angled, isosceles, equilateral speed and feed parameters
	Computer Basics
	SA13. use basic office applications like spread sheet, word processor, presentations SA14. use ERP software and other organizational software specific to quality function SA15. use email to communicate within the organization as per organization guidelines
B. Professional Skills	**Critical Thinking**
	The user/individual on the job needs to know and understand how to: SA16. participate in on-the-job and other learning, training and development interventions and assessments SA17. clarify task related information with appropriate personnel or technical adviser SA18. seek to improve and modify own work practices SA19. maintain current knowledge of application standards, legislation, codes of practice and product/process developments
	Problem Solving and Decision Making
	The user/individual on the job needs to know and understand how to: SB1. identify problems with work planning, procedures, output and behavior and their implications SB2. prioritize and plan for problem solving SB3. communicate problems appropriately to others

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	SB4. identify sources of information and support for problem solving SB5. seek assistance and support from other sources to solve problems SB6. identify effective resolution techniques SB7. select and apply resolution techniques SB8. seek evidence for problem resolution
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB9. plan, prioritize and sequence work operations as per job requirements SB10. organize and analyze information relevant to work SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB12. undertake and express new ideas and initiatives to others SB13. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB14. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB15. one's competencies in new and different situations and contexts to achieve more
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB16. exercise restraint while expressing dissent and during conflict situations SB17. avoid and manage distractions to be disciplined at work SB18. manage own time for achieving better results
	Teamwork
	The user/individual on the job needs to know and understand how to: SB19. work in a team in order to achieve better results SB20. identify and clarify work roles within a team SB21. communicate and cooperate with others in the team for better results SB22. seek assistance from fellow team members

CSC/ N 0123: Set computer numerically controlled vertical machining center to perform a range of operations on metal components

NOS Version Control

NOS Code	**CSC/ N 0123**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Industry	**Capital Goods**	**Drafted on**	**14/04/14**
Industry Sub-sector	1. Machine Tools 2. Dies, Moulds and Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering Goods	**Last reviewed on**	**18/03/15**
Occupation	**Machining**	**Next review date**	**30/08/16**

CSC/ N 0116: Perform a range of operations on metal components using computer numerical controlled vertical machining center

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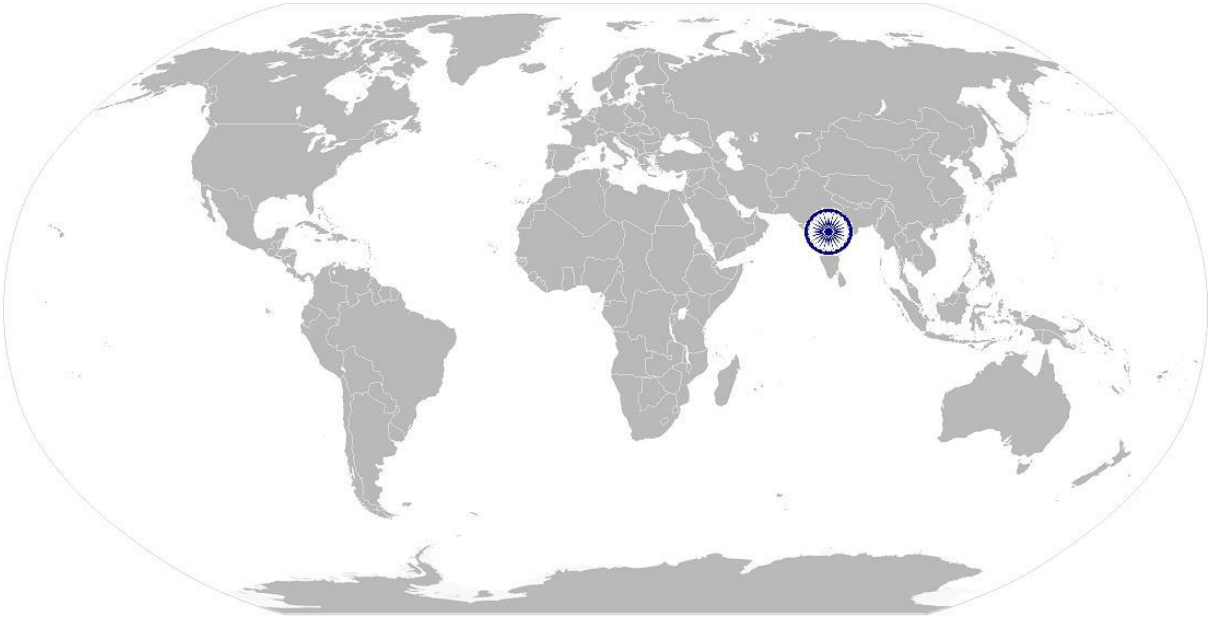
National Occupational Standard



Overview

This unit covers the operation of Computer Numerically Controlled (CNC) vertical machining center (VMC), in order to perform machining operations on metal components, as per specifications provided. It does not include machine setting or programming.

CSC/ N 0116: Perform a range of operations on metal components using computer numerical controlled vertical machining center

National Occupational Standard

Unit Code	CSC/ N 0116
Unit Title (Task)	**Perform a range of operations on metal components using computer numerical controlled vertical machining center**
Description	This unit covers operation of Computer Numerically Controlled (CNC) vertical machining center (VMC) with 3-axis, in order to perform multiple machining operations on metal and plastic components, as per specifications provided. It does not include machine setting or programming. It involves producing components that combine a number of different features, such as flat faces, parallel faces, faces square to each other, faces at an angle, steps/shoulders, open and enclosed slots, drilled, bored and reamed holes, internal threads, and special forms/profiles. The candidate will be expected to perform under supervision as per instructions given, taking personal responsibility for some actions and for the quality and accuracy of the work produced.
Scope	This unit/task covers the following: • Working safely • Preparing for machining activities on VMC • Performing machining operations on VMC

Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working safely	The user/individual on the job should be able to: PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing machining operations PC3. work following laid down procedures and instructions PC4. ensure work area is clean and safe from hazards PC5. ensure that all tools and equipment are in a safe and usable condition
Preparing for machining activities on VMC	The user/individual on the job should be able to: PC6. obtain job specification from a valid and approved source **Valid sources**: job instruction sheet/job card; work drawings and instructions; planning documentation; quality control documents; operation sheets; process specifications; instructions from supervisor PC7. read and establish job requirements from the job specification document accurately **Job requirements**: raw materials or components required (type, quality, quantity); dimensions; limits and tolerances; surface texture requirements; operations required (list, sequence and procedures where applicable); shape or profiles to be machined; tools to be used; interdependencies; timelines **Job specification documents**: detailed component drawings; approved sketches/illustrations; national, international and organisational standards; reference charts, tables, graphs; machining/assembly drawings PC8. report and rectify incorrect and inconsistent information in job specification documents as per organization procedures

CSC/ N 0116: Perform a range of operations on metal components using computer numerical controlled vertical machining center

	PC9. use and extract information from reference charts, tables, graphs and standards **Information pertaining to**: tapping sizes and threads; feeds and speeds; component ratings; machining symbols and tolerances PC10. prepare the work area for the machining operations as per procedure or operational specification PC11. ensure that the components used are free from foreign objects, dirt or other contamination PC12. conduct a preliminary check of the readiness of the vertical machining center **Preliminary check**: e.g. machine is clean, referencing-zero return, lubrication are functioning, coolant level is correct, sub-systems are working correctly, confirmation received from the machine setter that the machine is ready for production, etc. PC13. obtain correct workpieces/raw materials and consumables as per job requirements PC14. obtain appropriate cutting tools, hand tools and measuring tools as per job requirements **Hand tools**: allen keys, spanner, wrenches, mallet, pneumatic gun **Cutting tools**: mills (face, end), drills (twist/core, slot), boring tools, reamers, taps, special profile cutters PC15. ensure that all measuring equipment is calibrated and approved for usage **Measuring equipment**: scales, micrometers (external, internal, depth), verniers (digital, dial; length, depth; protractors), gauges (slip, bore/hole, thread, plug, radius/profile), dial test indicators (DTI), surface finish equipment (such as comparison plates, machines), templates PC16. set work pieces as per job requirements using appropriate positioning and/or holding devices and support mechanisms PC17. where appropriate, seek any necessary instruction/training on the operation of the machine PC18. check that the operating program is at the correct start point and the work piece is clear of the machine spindle
Performing machining operations on VMC	The user/individual on the job should be able to: PC19. switch the vertical machining center on and off in normal and emergency situations PC20. load and unload component(s) using pre-determined fixtures or work holding devices as per work instructions PC21. do trial run by taking back the tool offsets by a minimum amount keeping margin error rectification PC22. measure the critical parameters of the machined component on the machine (without removing from the machine), after the trial run **Critical parameters**: linear dimensions (such as lengths, depths), slots (position, width, depth), flatness, cylindricity, axis straightness, concentricity, squareness, parallelism, angles, recesses, thread fit, hole size/fit, surface finish PC23. correct the offsets based on the measurements by accessing program edit

CSC/ N 0116: Perform a range of operations on metal components using computer numerical controlled vertical machining center

	facility in order to enter tooling data **Tooling data**: offsets compensation, radius compensation PC24. ensure accuracy in the critical parameters of the machined components by performing multiple trial runs and subsequent adjustment of offsets PC25. measure the component after unloading to check for accuracy in the critical parameters as per job specifications PC26. produce machined components that combine different operations and have a range of applicable features **Features of machined components produced**: flat; square; parallel and angular faces; steps/shoulders; slots (open ended, enclosed, recesses); holes (drilled, bored, reamed, tapped); hole and end mill ops; profiles (external, internal, curved); special forms (such as concave, convex); grooves; undercuts; threads (internal, external); radius PC27. follow the specified machining sequence and procedure as per job specifications PC28. interpret in-built alarms and error codes of equipment and respond to the same as per operating manual/organizational guidelines PC29. inspect as per frequency of inspection mentioned in the inspection plan (part of the job specifications) PC30. record the measured values as per organizational procedure PC31. observe for inconsistency in dimensions due to tool wear and correct the offsets accordingly PC32. ensure that machine settings are adjusted as and when required, either by self or the setter, to maintain the required accuracy PC33. identify when tools need resharpening/replacing PC34. remove worn out tool and replace with a suitable tool PC35. perform basic maintenance checks on the machine after operations **Basic maintenance activities**: replenish coolant; replenish lubrication oil; ensure all parts are clean; perform housekeeping tasks on the machine; remove and dispose swarf (turnings, filings or shavings); check lubrication levels PC36. keep finished components as well as raw material as per organizational procedure established PC37. produce components as per standards applicable to the process **Produce components standards**: components to be free from false tool cuts, burrs and sharp edges; general dimensional tolerance +/- 0.02mm; surface finish within 1.6µm; reamed holes within H7; screw threads 6G/6H; angles/tapers within +/- 15 sec; flatness and squareness 0.025mm per 25mm PC38. work to achieve production targets PC39. report conditions and seek appropriate assistance in a timely manner to address risk of failure to comply with necessary targets and specifications PC40. deal with finished components as per organizational guidelines PC41. return all tools and equipment to the correct location on completion of the machining activities PC42. update log book and complete necessary documentation during and post operations as per organizational procedures

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	PC43. leave the work area in a safe and tidy condition on completion of job activities
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions KA2. relevant health and safety requirements applicable in the work place KA3. importance of working in clean and safe environment KA4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities KA5. reporting structure, inter-dependent functions, lines and procedures in the work area KA6. relevant people and their responsibilities within the work area KA7. escalation matrix and procedures for reporting work and employment related issues KA8. documentation and related procedures applicable in the context of employment and work KA9. importance and purpose of documentation in context of employment and work
B. Technical Knowledge	The user/individual on the job needs to know and understand KB1. specific safe working practices, VMC machining procedures and environmental regulations that must be observed **Safe working practices and procedures**: ensuring the correct isolation of the machine before mounting work-holding devices and tooling; fitting and adjusting machine guards; ensuring that the work-piece is secure and that tooling is free from work-piece before starting the machine; ensuring personal protective equipment (PPE) to be worn for the CNC machining activities such as correctly fitting overalls and safety glasses; ensuring long hair is tied back or netted; jewellery or other items that can become entangled in the machinery are removed KB2. safety mechanism on the machine and how to check if they are functioning properly **Safety mechanisms on the machine**: emergency stop buttons, emergency brakes KB3. hazards associated with carrying out the machining operations on a VMC and how can they be minimised **Hazards**: automatic machine operations; revolving/moving parts of machinery; airborne and hot metal particles; sharp cutting tools; lifting and handling work-holding devices; burrs and sharp edges on component; use of power operated chucks; moving machinery; hot and airborne metal and particles and fluid KB4. personal protective equipment to be used during the machining activities on a VMC and where can it be obtained KB5. types and sources of appropriate job specifications **Valid sources**: job instruction sheet/job card; work drawings and instructions; planning documentation; quality control documents; operation sheets;

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	process specifications; instructions from supervisor KB6. common terminology used in VMC machining KB7. how to extract information from engineering drawings, dimensioning and labeling data **Drawings, dimensioning and labeling**: projections [orthographic (first angle, third angle), isometric (including exploded), oblique]; reference points, lines, edges and surfaces, continuous dimensions, baseline dimensions KB8. uses and applications of a VMC KB9. main features and working parts of the VMC, and the tools and accessories that can be used KB10. how to read and interpret first and third angle component drawings KB11. importance of following specified machining sequences and procedures KB12. importance of ensuring suitability of workpieces/materials and consumables for the specified job and related procedures KB13. tools and equipment used for machining operations on a VMC KB14. importance and procedures to ensure that tools and equipment are in a safe and usable condition KB15. how to use tools in different types of operations KB16. various CNC machining operations that can be performed, and the methods and equipment used KB17. correct techniques and procedures to carry out specific machining operations on a VMC KB18. factors that affect feed and speed **Factors**: type and condition of material; work-holding devices and method; tooling used; tolerance to be achieved; finish to be achieved; machine working condition (performance) KB19. importance of using correct procedures as per raw materials form of supply/ shapes **Raw materials forms of supply/ shapes**: square/rectangular (eg. bar stock, sheet material, machined components), circular/cylindrical (eg. bar stock, tubes, turned components, flat discs), irregular shapes/profile (eg. castings, forgings, odd shaped components) KB20. the function of error messages, and what to do when an error message is displayed KB21. importance of securing the work-piece/raw material correctly using appropriate devices and mechanisms KB22. importance of setting the work-holding device in relationship to the machine axis and reference points KB23. common problems that can occur in VMC machining operations and their implications KB24. correct procedures to address problems commonly encountered during VMC machining operations KB25. importance of reporting problems immediately and accurately KB26. meaning and importance of quality in relation to final and intermediate job output KB27. how to do self-inspection of the shaped components against the specified quality standards

	KB28. range of materials used in relevant VMC machining applications **Range of materials**: ferrous metals: e.g. carbon steels, stainless steels, cast iron, tool steel, hard metals; non-ferrous metals: e.g. bronze, aluminium, copper, copper alloys; non-metals: eg. plastic KB29. the relevant mechanical properties of materials and implications for job KB30. the British and metric(SI) systems of measurement KB31. absolute and incremental systems of tool positioning and offsetting KB32. work-piece zero/reference points and system of tolerances KB33. the use of tungsten carbide, ceramic and diamond indexible tips, and the factors which will determine their selection and use **Factors to determine selection and use of tungsten carbide, ceramic and diamond indexible tips**: hardness of the material, the cutting characteristics of the material, tolerances to be achieved, component surface finish, component specifications KB34. the use of tool magazines and carousels KB35. importance of conducting trial runs KB36. the items that they need to check before allowing the machine to operate in full program run mode KB37. Importance of periodic maintenance checks for the machine and what are the common maintenance checks **Basic maintenance activities**: replenish coolant; replenish lubrication oil; ensure all parts are clean; perform housekeeping tasks on the machine; remove and dispose swarf (turnings, filings or shavings); check lubrication levels KB38. span and scope of authority when dealing with problems and avenues of support and escalation KB39. importance of passing on information after completion shifts in an effective and efficient manner KB40. importance of leaving the work area and machine in a safe condition on completion of the activities **Safe condition**: correctly isolated; operating programs closed or removed; cleaning the machine; ensuring that any spilt cutting fluids are correctly dealt with; disposing of waste
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Communication (Reading, Writing, Listening and Speaking)** The user/ individual on the job needs to know and understand how to: SA1. read and interpret information correctly from various job specification documents, manuals, health and safety instructions, memos, etc. applicable to the job in English and/or local language **Job specification documents**: detailed component drawings; approved sketches/illustrations; national, international and organisational standards; reference charts, tables, graphs; machining/assembly drawings SA2. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language SA3. convey and share technical information clearly using appropriate language SA4. check and clarify task-related information

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	SA5. liaise with appropriate authorities using correct protocol SA6. communicate with people in respectful form and manner in line with organizational protocol
	Numerical and computational skills
	The user/individual on the job needs to know and understand how to: SA7. undertake basic numerical operations, and calculations/ formulae **numerical computations**: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages **algebraic expressions**: represent numerical quantities using symbols, apply laws of precedence in the use of precedence (BODMAS) SA8. identify various basic, compound and solid shapes as per dimensions given **Basic shapes**: square, rectangle, triangle, circle **Compound shapes**: involving squares, rectangles, triangles, circles, semi-circles, quadrants of a circle **Solid shapes**: cube, rectangular prism, cylinder SA9. use appropriate measuring techniques and units of measurement SA10. use appropriate units and number systems to express degree of accuracy **Units and number systems representing degree of accuracy**: decimals places, significant figures, fractions as a decimal quantity SA11. use metric systems of measurement **Angles in a triangle**: right-angled, isosceles, equilateral
B. Professional Skills	**Critical Thinking**
	The user/individual on the job needs to know and understand how to: SA12. participate in on-the-job and other learning, training and development interventions and assessments SA13. clarify task related information with appropriate personnel or technical adviser SA14. seek to improve and modify own work practices SA15. maintain current knowledge of application standards, legislation, codes of practice and product/process developments
	Problem Solving and Decision Making
	The user/individual on the job needs to know and understand how to: SB1. identify problems with work planning, procedures, output and behavior and their implications SB2. prioritize and plan for problem solving SB3. communicate problems appropriately to others SB4. identify sources of information and support for problem solving SB5. seek assistance and support from other sources to solve problems SB6. identify effective resolution techniques SB7. select and apply resolution techniques SB8. seek evidence for problem resolution
	Plan and Organize

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	The user/individual on the job needs to know and understand how to: SB9. plan, prioritize and sequence work operations as per job requirements SB10. organize and analyze information relevant to work SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB12. undertake and express new ideas and initiatives to others SB13. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB14. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB15. one's competencies in new and different situations and contexts to achieve more
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB16. exercise restraint while expressing dissent and during conflict situations SB17. avoid and manage distractions to be disciplined at work SB18. manage own time for achieving better results
	Teamwork
	The user/individual on the job needs to know and understand how to: SB19. work in a team in order to achieve better results SB20. identify and clarify work roles within a team SB21. communicate and cooperate with others in the team for better results SB22. seek assistance from fellow team members

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NOS Version Control

NOS Code	**CSC/ N 0116**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Industry	**Capital Goods**	**Drafted on**	**14/04/14**
Industry Sub-sector	1. Machine Tools 2. Dies Moulds and Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering Goods	**Last reviewed on**	**18/03/15**
Occupation	**Machining**	**Next review date**	**30/08/16**

CSC/ N 1335: Use basic health and safety practices at the workplace

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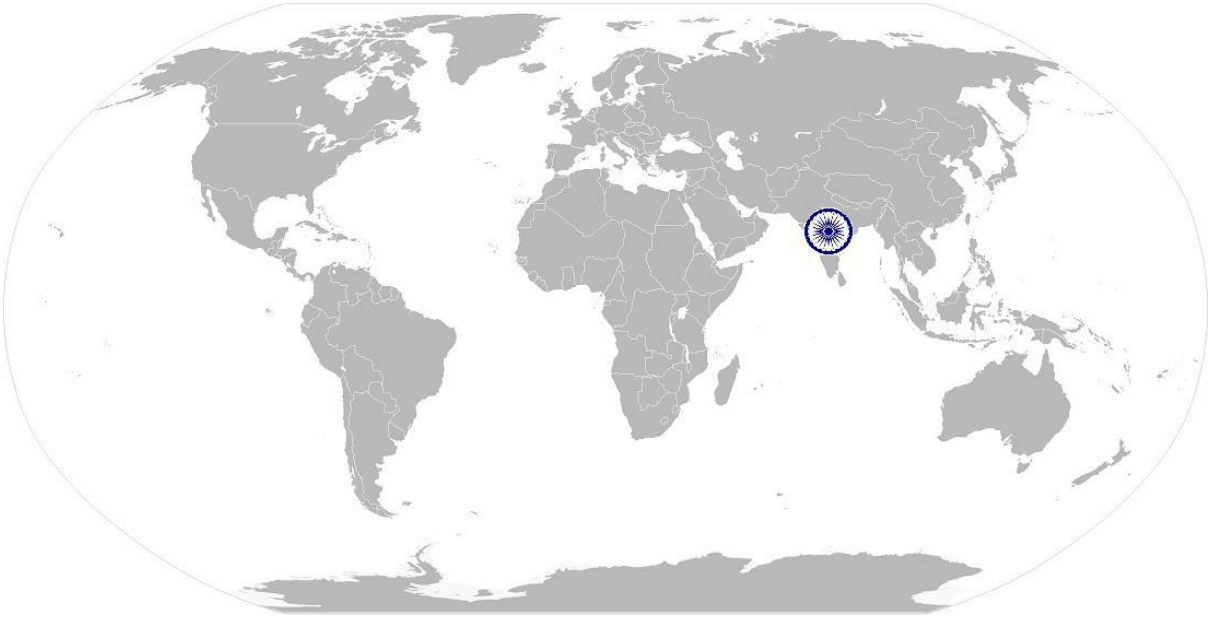
National Occupational Standard



Overview

This unit covers health, safety and security at the workplace. This includes procedures and practices that candidates need to follow to help maintain a healthy, safe and secure work environment.

CSC/ N 1335: Use basic health and safety practices at the workplace

National Occupational Standard

Unit Code	CSC / N 1335
Unit Title (Task)	**Use basic health and safety practices at the workplace**
Description	This OS unit is about knowledge and practices relating to health, safety and security that candidates need to use in the workplace. It covers responsibilities towards self, others, assets and the environment. It includes understanding of risks and hazards in the workplace, along with common techniques to minimize risk, deal with accidents, emergencies, etc. It covers knowledge of fire safety, common first aid applications, safe practices and emergency procedures.
Scope	This unit/task covers the following: • Health and safety • Fire safety • Emergencies, rescue and first-aid procedures
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Health and safety	The user/individual on the job should be able to: PC1. use protective clothing/equipment for specific tasks and work conditions **Protective clothing**: leather or asbestos gloves, flame proof aprons, flame proof overalls buttoned to neck, cuffless (without folds), trousers, reinforced footwear, helmets/hard hats, cap and shoulder covers, ear defenders/plugs, safety boots, knee pads, particle masks, glasses/goggles/visors **Equipment**: hand shields, machine guards, residual current devices, shields, dust sheets, respirator PC2. state the name and location of people responsible for health and safety in the workplace PC3. state the names and location of documents that refer to health and safety in the workplace PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace **Hazards**: sharp edged and heavy tools; heated metals; oxyfuel and gas cylinders; welding radiation; hazardous surfaces(sharp, slippery, uneven, chipped, broken, etc.); hazardous substances(chemicals, gas, oxy-fuel, fumes, dust, etc.); physical hazards(working at heights, large and heavy objects and machines, sharp and piercing objects, tolls and machines, intense light, load noise, obstructions in corridors, by doors, blind turns, noise, over stacked shelves and packages, etc.) electrical hazards (power supply and points, loose and naked cables and wires, electrical machines and appliances, etc.)

CSC/ N 1335: Use basic health and safety practices at the workplace

	Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness) PC5. carry out safe working practices while dealing with hazards to ensure the safety of self and others **Safe working practices**: using protective clothing and equipment; putting up and reading safety signs; handle tools in the correct manner and store and maintain them properly; keep work area clear of clutter, spillage and unsafe object lying casually; while working with electricity take all electrical precautions like insulated clothing, adequate equipment insulation, use of control equipment, dry work area, switch off the power supply when not required, etc.; safe lifting and carrying practices; use equipment that is working properly and is well maintained; take due measures for safety while working in confined places, trenches or at heights, etc. including safety harness, fall arrestors, etc. PC6. state methods of accident prevention in the work environment of the job role **Methods of accident prevention**: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors PC7. state location of general health and safety equipment in the workplace **General health and safety equipment**: fire extinguishers; first aid equipment; safety instruments and clothing; safety installations(eg fire exits, exhaust fans) PC8. inspect for faults, set up and safely use steps and ladders in general use **Ladder faults**: corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/ unfixed nuts or bolts, etc. **Ladders set up**: firm/level base, clip/lash down, leaning at the correct angle, etc. PC9. work safely in and around trenches, elevated places and confined areas PC10. lift heavy objects safely using correct procedures PC11. apply good housekeeping practices at all times **Good housekeeping practices**: clean/tidy work areas, removal/disposal of waste products, protect surfaces PC12. identify common hazard signs displayed in various areas **Various areas**: on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc. PC13. retrieve and/or point out documents that refer to health and safety in the workplace

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	Documents: fire notices, accident reports, safety instructions for equipment and procedures, company notices and documents, legal documents (eg government notices)
Fire safety	The user/individual on the job should be able to: PC14. use the various appropriate fire extinguishers on different types of fires correctly **Types of fires**: Class A: eg. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: eg. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no longer receiving electricity); Class D: combustible metals such as magnesium, titanium, and sodium (These fires burn at extremely high temperatures and require special suppression agents) PC15. demonstrate rescue techniques applied during fire hazard PC16. demonstrate good housekeeping in order to prevent fire hazards PC17. demonstrate the correct use of a fire extinguisher
Emergencies, rescue and first-aid procedures	The user/individual on the job should be able to: PC18. demonstrate how to free a person from electrocution PC19. administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc. PC20. demonstrate basic techniques of bandaging PC21. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments PC22. perform and organize loss minimization or rescue activity during an accident in real or simulated environments PC23. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases PC24. demonstrate the artificial respiration and the CPR Process PC25. participate in emergency procedures **Emergency procedures**: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call, correct return to work PC26. complete a written accident/incident report or dictate a report to another person, and send report to person responsible **Incident Report includes details of**: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified PC27. demonstrate correct method to move injured people and others during an emergency
Knowledge and Understanding (K)	

CSC/ N 1335: Use basic health and safety practices at the workplace

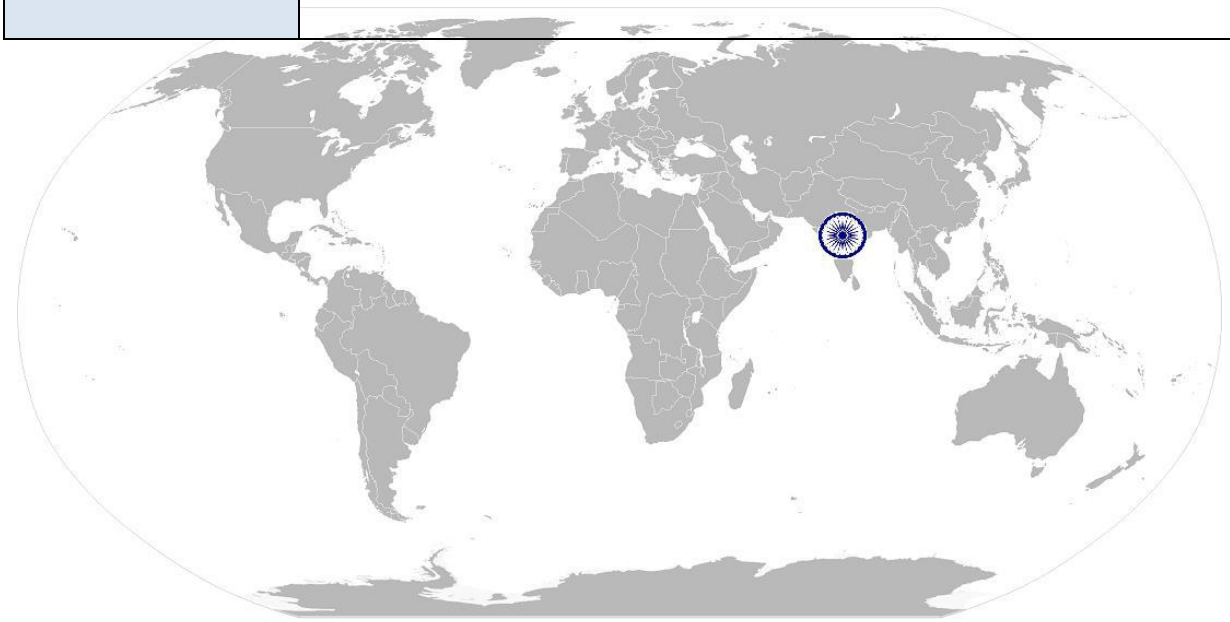
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. names (and job titles if applicable), and where to find, all the people responsible for health and safety in a workplace. KA2. names and location of documents that refer to health and safety in the workplace.
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. meaning of "hazards" and "risks" KB2. health and safety hazards commonly present in the work environment and related precautions KB3. possible causes of risk, hazard or accident in the workplace and why risk and/or accidents are possible KB4. possible causes of risk and accident **Possible causes of risk and accident**: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness) KB5. methods of accident prevention **Methods of accident prevention**: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors KB6. safe working practices when working with tools and machines KB7. safe working practices while working at various hazardous sites KB8. where to find all the general health and safety equipment in the workplace KB9. various dangers associated with the use of electrical equipment KB10. preventative and remedial actions to be taken in the case of exposure to toxic materials **Exposure:** ingested, contact with skin, inhaled **Preventative action**: ventilation, masks, protective clothing/ equipment); **Remedial action:** immediate first aid, report to supervisor **Toxic materials:** solvents, flux, lead KB11. importance of using protective clothing/equipment while working KB12. precautionary activities to prevent the fire accident KB13. various causes of fire **Causes of fires**: heating of metal; spontaneous ignition; sparking; electrical heating; loose fires (smoking, welding, etc.); chemical fires; etc. KB14. techniques of using the different fire extinguishers KB15. different methods of extinguishing fire KB16. different materials used for extinguishing fire **Materials**: sand, water, foam, CO2, dry powder KB17. rescue techniques applied during a fire hazard KB18. various types of safety signs and what they mean

CSC/ N 1335: Use basic health and safety practices at the workplace

	KB19. appropriate basic first aid treatment relevant to the condition eg. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries KB20. content of written accident report KB21. potential injuries and ill health associated with incorrect manual handing KB22. safe lifting and carrying practices KB23. personal safety, health and dignity issues relating to the movement of a person by others KB24. potential impact to a person who is moved incorrectly
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Reading and Writing Skills**
	The user/individual on the job needs to know and understand how to: SA1. read and comprehend basic content to read labels, charts, signages SA2. read and comprehend basic English to read manuals of operations SA3. read and write an accident/incident report in local language or English
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA4. question coworkers appropriately in order to clarify instructions and other issues SA5. give clear instructions to coworkers, subordinates others
	Decision Making
	The user/individual on the job needs to know and understand how to: SA6. make appropriate decisions pertaining to the concerned area of work with respect to intended work objective, span of authority, responsibility, laid down procedure and guidelines
B. Professional Skills	**Plan and Organize**
	The user/individual on the job needs to know and understand how to: SB1. plan and organize their own work schedule, work area, tools, equipment and materials to maintain decorum and for improved productivity
	Working with others
	The user/individual on the job needs to know and understand how to: SB2. remain congenial while discussing and debating issues with co-workers SB3. follow appropriate protocols for communication based on situation, hierarchy, organizational culture and practice SB4. ask for, provide and receive required assistance where possible to ensure achievement of work related objectives SB5. thank coworkers for any assistance received SB6. offer appropriate respect based on mutuality and respect for fellow worksmanship and authority

CSC/ N 1335: Use basic health and safety practices at the workplace

	Problem Solving
	The user/individual on the job needs to know and understand how to: SB7. think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) SB8. identify immediate or temporary solutions to resolve delays SB9. identify sources of support that can be availed of for problem solving for various kind of problems SB10. seek appropriate assistance from other sources to resolve problems SB11. report problems that you cannot resolve to appropriate authority
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB12. identify cause and effect relations in their area of work SB13. use cause and effect relations to anticipate potential problems and their solution

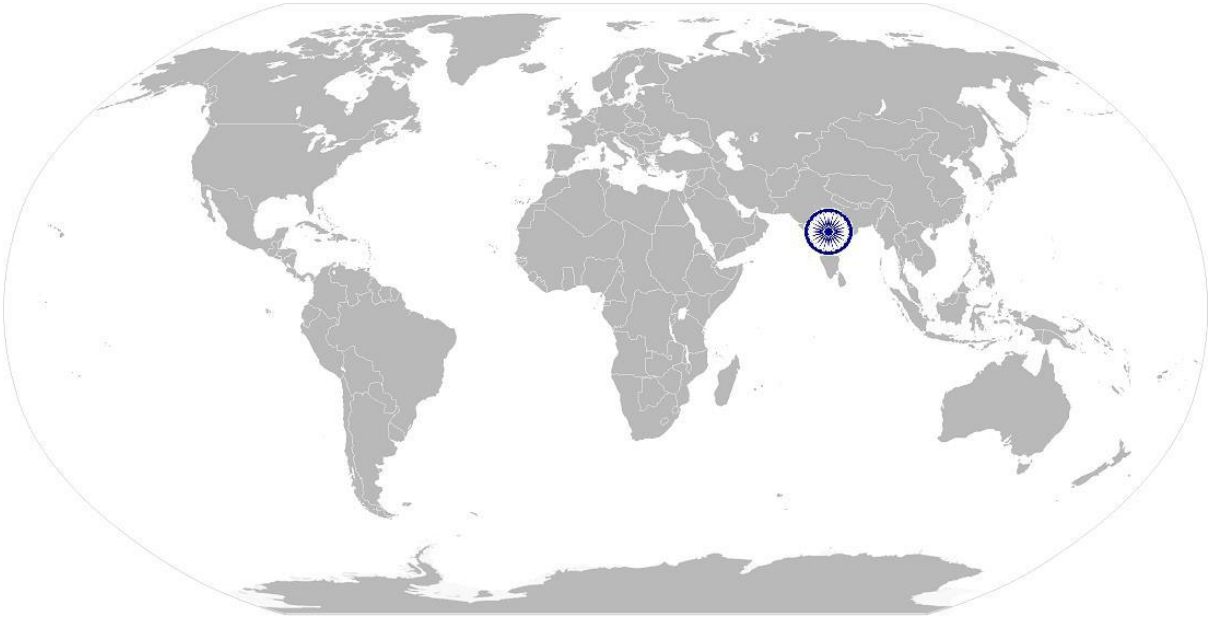


CSC/ N 1335: Use basic health and safety practices at the workplace

NOS Version Control

NOS Code	CSC / N 1335		
Credits (NSQF)	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	10/04/14
Industry Sub-sector	1. Machine Tools 2. Dies, Moulds And Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Generation Machinery 7. Light Engineering Goods	Last reviewed on	18/03/15
Occupation	Machining	Next review date	30/08/16

National Occupational Standard



Overview

This unit covers basic practices that improve effectiveness of working with others in an organizational set-up.

National Occupational Standard

CSC/ N 1336: Work effectively with others

Unit Code	**CSC / N 1336**
Unit Title (Task)	**Work effectively with others**
Description	This unit covers basic etiquette and competencies that a candidate is required to possess and demonstrate in their behavior and interactions with others at the workplace. These cover areas such as communication etiquette, discipline, listening, handling conflict and grievances.
Scope	This unit/task covers the following: • Working with others

Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working with others	The user/individual on the job should be able to: PC1. accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required PC2. accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt PC3. give information to others clearly, at a pace and in a manner that helps them to understand PC4. display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible PC5. consult with and assist others to maximize effectiveness and efficiency in carrying out tasks PC6. display appropriate communication etiquette while working **Communication etiquette:** do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa)etc. PC7. display active listening skills while interacting with others at work PC8. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism PC9. demonstrate responsible and disciplined behaviors at the workplace **Disciplined behaviors:** e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc. PC10. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict

Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions KA2. reporting structure, inter-dependent functions, lines and procedures in the work area KA3. relevant people and their responsibilities within the work area KA4. escalation matrix and procedures for reporting work and employment related issues

CSC/ N 1336: Work effectively with others

B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. various categories of people that one is required to communicate and co-ordinate with in the organization KB2. importance of effective communication in the workplace KB3. importance of teamwork in organizational and individual success KB4. various components of effective communication KB5. key elements of active listening KB6. value and importance of active listening and assertive communication KB7. barriers to effective communication KB8. importance of tone and pitch in effective communication KB9. importance of avoiding casual expletives and unpleasant terms while communicating professional circles KB10. how poor communication practices can disturb people, environment and cause problems for the employee, the employer and the customer KB11. importance of ethics for professional success KB12. importance of discipline for professional success KB13. what constitutes disciplined behavior for a working professional KB14. common reasons for interpersonal conflict KB15. importance of developing effective working relationships for professional success KB16. expressing and addressing grievances appropriately and effectively KB17. importance and ways of managing interpersonal conflict effectively
Skills (S) [Optional]	

CSC/ N 1336: **Work effectively with others**

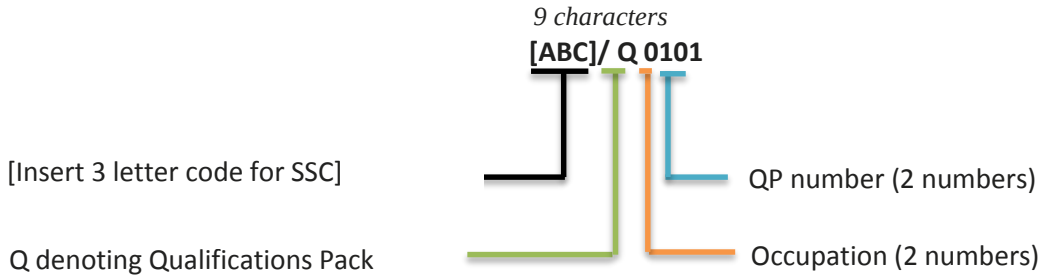
NOS Version Control

NOS Code	**CSC / N 1336**		
Credits(NSQF)	**TBD**	**Version number**	**1.0**
Industry	**Capital Goods**	**Drafted on**	**10/04/14**
Industry Sub-sector	1. Machine Tools 2. Dies, Moulds And Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering Goods	**Last reviewed on**	**18/03/15**
Occupation	**Machining**	**Next review date**	**30/08/16**

Annexure

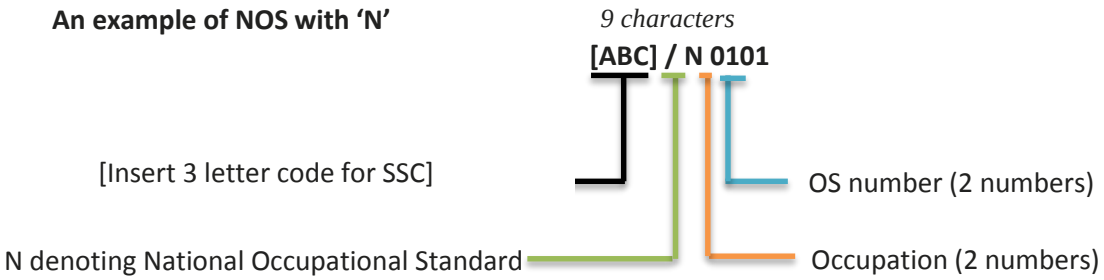
Nomenclature for QP and NOS

Qualifications Pack



Occupational Standard

An example of NOS with 'N'



The following acronyms/codes have been used in the nomenclature above:

Sub-sector	Range of Occupation numbers
Machine Tools	01-13
Dies, Moulds And Press Tools	01-13
Plastic Manufacturing Machinery	01-13
Textile Manufacturing Machinery	01-13
Process Plant Machinery	01-13
Electrical and Power Machinery	01-13
Light Engineering Goods	01-13

Sequence	Description	Example
Three letters	Capital Goods	CSC
Slash	/	/
Next letter	Whether **Q**P or **N**OS	N
Next two numbers	Occupation code	01
Next two numbers	OS number	01

CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role : CNC Setter cum Operator - Vertical Machining Centre
Qualification Pack : CSC/ Q 0123

Sector Skill Council : Capital Goods sector skill Council

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.

Assessable Outcomes	Assessment Criteria	Total Marks	Out Of	Theory	Practical Skill
CSC/ N 0123 : Set computer numerically controlled vertical machining center to perform a range of operations on metal components	PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work	100	2	1	1
	PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing VMC setting operations		3	1	2
	PC3. work following laid down procedures and instructions		2	1	1
	PC4. ensure work area is clean and safe from hazards		1	0	1
	PC5. ensure that all tools and equipment are in a safe and usable condition		1	0	1
	PC6. ensure that the components used are free from foreign objects, dirt or other contamination		1	0	1
	PC7. obtain job specification from a valid and approved source		1	0	1

	PC8. read and establish job requirements from the job specification document accurately		4	2	2
	PC9. report and rectify incorrect and inconsistent information in job specification documents as per organization procedures		1	0	1
	PC10. prepare the work area for the VMC setting operations as per procedure or specification received		2	0	2
	PC11. conduct a preliminary check of the readiness of the VMC machine		3	1	2
	PC12. conduct a preliminary check of the readiness of the components and cutters		2	1	1
	PC13. obtain appropriate cutting tools and hand tools and measuring tools as per job requirements		3	1	2
	PC14. ensure that all measuring equipment is calibrated and approved for usage		2	0	2
	PC15. extract and use information from engineering drawings and relate specifications in relation to work undertaken		3	1	2
	PC16. use and extract information from reference charts, tables, graphs and standards		2	1	1
	PC17. identify tool requirements from tooling layout and assess their suitability		3	1	2
	PC18. identify suitable work-holding or fixturing device as per the job requirement		3	1	2
	PC19. ensure that the tools and fixtures are in usable condition(free from breakage, damage, calibration, etc)		1	0	1
	PC20. ensure the correct and latest part-program is uploaded onto the CNC system		2	0	2
	PC21. pre-set the tooling using setting jigs/fixtures		3	1	2

	PC22. where appropriate, seek any necessary instruction/training on the operation of the machine		1	0	1
	PC23. mount and set the required work-holding devices, work-piece and cutting tools		3	1	2
	PC24. check that the tools have a specific tool number in relation to the operating program		1	0	1
	PC25. enter all relevant tool data to the operating program on the CNC		3	1	2
	PC26. set tool datums, positions, lengths, offsets and radius compensation		4	1	3
	PC27. mount the work-holding device/fixture onto the machine		4	1	3
	PC28. set the work-holding device/fixture in relationship to the machine datum's and reference points		4	1	3
	PC29. set the machine tool operating parameters(eg hydraulic pressure, clamping) as per the component requirements		5	2	3
	PC30. place the machine into the correct operating mode, and access the program edit facility in order to enter tooling data		4	1	3
	PC31. conduct trial runs using single block run, dry run and feed and speed override controls		5	2	3
	PC32. prove the program tool by tool in single block mode		4	2	2
	PC33. perform the necessary checks before allowing the machine to operate in full program run mode		2	1	1
	PC34. check and hand-over the machine after set-up to the machine operator along with relevant instructions and documentation		4	2	2
	PC35. complete relevant documentation as per organizational procedure		1	0	1

	PC36. handle the typical problems that can occur with the setting up of the tooling, work-holding devices and proving the program		2	1	1
	PC37. switch the VMC machine on and off in normal and emergency situations		1	0	1
	PC38. after use, return the old cutting tools, work-holding device, fixtures, instruments, drawings and verified tapes and programs back to store, safely and correctly		1	0	1
	PC39. ensure that there is no damage to the tool/fixture while doing the prove-out		1	0	1
	PC40. complete documentation during and post operations and submit as per organizational procedures		2	1	1
	PC41. deal promptly and effectively with problems within the setter's control, and seek help and guidance from the relevant people, in case of problems that cannot beresolved		1	0	1
	PC42. shut down the equipment to a safe condition on conclusion of the activities		1	0	1
	PC43. leave the work area in a safe and tidy condition on completion of the setting activities		1	0	1
		Total	**100**	**30**	**70**
CSC/ N 0116 : Perform a range of operations on metal components using computer numerical controlled vertical machining center	PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work	**100**	2	1	1
	PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing machining operations		3	1	2
	PC3. work following laid down procedures and instructions		1	0	1
	PC4. ensure work area is clean and safe from hazards		1	0	1

	PC5. ensure that all tools and equipment are in a safe and usable condition		1	0	1
	PC6. obtain job specification from a valid and approved source		1	0	1
	PC7. read and establish job requirements from the job specification document accurately		3	1	2
	PC8. report and rectify incorrect and inconsistent information in job specification documents as per organization procedures		2	0	2
	PC9. use and extract information from reference charts, tables, graphs and standards		3	1	2
	PC10. prepare the work area for the machining operations as per procedure or operational specification		3	1	2
	PC11. ensure that the components used are free from foreign objects, dirt or other contamination		1	0	1
	PC12. conduct a preliminary check of the readiness of the vertical machining center		1	0	1
	PC13. obtain correct workpieces/raw materials and consumables as per job requirements		2	1	1
	PC14. obtain appropriate cutting tools, hand tools and measuring tools as per job requirements		3	1	2
	PC15. ensure that all measuring equipment is calibrated and approved for usage		2	0	2
	PC16. set work pieces as per job requirements using appropriate positioning and/or holding devices and support mechanisms		3	1	2
	PC17. where appropriate, seek any necessary instruction/training on the operation of the machine		2	0	2
	PC18. check that the operating program is at the correct start point and the work piece is clear of the		2	0	2

	PC19. switch the vertical machining center on and off in normal and emergency situations		1	0	1
	PC20. load and unload component(s) using pre-determined fixtures or work holding devices as per work instructions		3	1	2
	PC21. do trial run by taking back the tool offsets by a minimum amount keeping margin error rectification		2	0	2
	PC22. measure the critical parameters of the machined component on the machine (without removing from the machine), after the trial run		3	1	2
	PC23. correct the offsets based on the measurements		3	1	2
	PC24. ensure accuracy in the critical parameters of the machined components by performing multiple trial runs and subsequent adjustment of offsets		3	1	2
	PC25. measure the component after unloading to check for accuracy in the critical parameters as per job specifications		4	1	3
	PC26. produce machined components that combine different operations and have a range of applicable features		4	2	2
	PC27. follow the specified machining sequence and procedure as per job specifications		3	1	2
	PC28. interpret in-built alarms and error codes of equipment and respond to the same as per operating manual/organizational guidelines		3	1	2
	PC29. inspect as per frequency of inspection mentioned in the inspection plan (part of the job specifications)		3	1	2
	PC30. record the measured values as per organizational procedure		2	1	1

	PC31. observe for inconsistency in dimensions due to tool wear and correct the offsets accordingly		2	1	1
	PC32. ensure that machine settings are adjusted as and when required, either by self or the setter, to maintain the required accuracy		4	2	2
	PC33. identify when tools need resharpening/replacing		3	1	2
	PC34. remove worn out tool and replace with a suitable tool		2	0	2
	PC35. perform basic maintenance checks on the machine after operations		4	1	3
	PC36. keep finished components as well as raw material as per organizational procedure established		1	0	1
	PC37. produce components as per standards applicable to the process		4	1	3
	PC38. work to achieve production targets		2	0	2
	PC39. report conditions and seek appropriate assistance in a timely manner to address risk of failure to comply with necessary targets and specifications		2	0	2
	PC40. deal with finished components as per organizational guidelines		2	0	2
	PC41. return all tools and equipment to the correct location on completion of the machining activities		1	0	1
	PC42. update log book and complete necessary documentation		1	0	1
	PC43. leave the work area in a safe and tidy condition on completion of job activities		2	0	2
		Total	**100**	**25**	**75**
CSC/ N 1335 : Use basic health and safety practices at the workplace	PC1. use protective clothing/equipment for specific tasks and work conditions	**100**	5	2	3
	PC2. state the name and location of people responsible for health and safety in the workplace		3	1	2

	PC3. state the names and location of documents that refer to health and safety in the workplace		3	1	2
	PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace		5	2	3
	PC5. carry out safe working practices while dealing with hazards to ensure the safety of self and others state methods of accident prevention in the work environment of the job role		4	2	2
	PC6. state location of general health and safety equipment in the workplace		3	2	1
	PC7. inspect for faults, set up and safely use steps and ladders in general use		5	2	3
	PC8. work safely in and around trenches, elevated places and confined areas		5	2	3
	PC9. lift heavy objects safely using correct procedures		5	2	3
	PC10. apply good housekeeping practices at all times		4	2	2
	PC11. identify common hazard signs displayed in various areas		5	2	3
	PC12. retrieve and/or point out documents that refer to health and safety in the workplace		3	1	2
	PC13. use the various appropriate fire extinguishers on different types of fires correctly		4	1	3
	PC14. demonstrate rescue techniques applied during fire hazard		4	1	3
	PC15. demonstrate good housekeeping in order to prevent fire hazards		3	1	2
	PC16. demonstrate the correct use of a fire extinguisher		4	1	3
	PC17. demonstrate how to free a person from electrocution		4	1	3

	PC18. administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.		4	1	3
	PC19. demonstrate basic techniques of bandaging		3	1	2
	PC20. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		4	1	3
	PC21. perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC22. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2
	PC23. demonstrate the artificial respiration and the CPR Process		3	1	2
	PC24. participate in emergency procedures		3	2	1
	PC25. complete a written accident/incident report or dictate a report to another person, and send report to person responsible		4	1	3
	PC26. demonstrate correct method to move injured people and others during an emergency		4	1	3
		Total	**100**	**36**	**64**
CSC/ N 1336 : Work effectively with others	PC1. accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	**100**	10	3	7
	PC2. accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt		10	3	7
	PC3. give information to others clearly, at a pace and in a manner that helps them to understand		10	3	7

	PC4. display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible		10	3	7
	PC5. consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	3	7
	PC6. display appropriate communication etiquette while working		10	3	7
	PC7. display active listening skills while interacting with others at work		10	3	7
	PC8. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		10	3	7
	PC9. demonstrate responsible and disciplined behaviors at the workplace		10	3	7
	PC10. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		10	3	7
		Total	**100**	**30**	**70**