QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR CAPITAL GOODS INDUSTRY

Contents

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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: Tool and Die Maker

SECTOR: CAPITAL GOODS

SUB-SECTOR:

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

OCCUPATION: Fitting and Assembly

REFERENCE ID: CSC/ Q 0146

Tool and Die Maker: Identifying tool or die specifications from design, plan and organize for making of tool and die, perform fitting activities using hand tools, manually operated machines and conventional machines, assemble the tool.

Brief Job Description: It involves identifying the various operations required to make the tool or die and further sequence the same. Organise for these operations to be performed either by self or others. Must have a complete understanding of all the processes and operations required for tool and die making.

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 0146		
Job Role	**Tool and Die Maker**		
Credits(NSQF) [*OPTIONAL*]	**TBD**	**Version number**	1.0
Sector	CAPITAL GOODS	**Drafted on**	24/03/14
Sub-sector	1. Machine Tools 2. Tools Dies And Press Tools 3. Plastic Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering	**Last reviewed on**	
Occupation	Fitting and Assembly	**Next review date**	30/03/14

Job Role	Tool and Die Maker
Role Description	Identifying customer's requirements, creating a desgn brief, planning desgn activities, creating and evaluating desgn options, creating details design using 2D and 3D softwares for design.
NSQF level	L5
Minimum Educational Qualifications* **Maximum Educational Qualifications***	Diploma or Degree
Training (Suggested but not mandatory)	TBD
Experience	TBD
Applicable National Occupational Standards (NOS)	**Compulsory:** CSC/ N 0158 Plan and co-ordinate the making of tools and die CSC/ N 0160 Perform fitting operations on metal components for making tools and dies using hand tools and manually operated machines CSC/ N 0102 Grind surface using hand and/or hand-held power tools CSC/ N 0107 Operate conventional milling machines CSC/ N 0108 Operate conventional turning machines CSC/ N 0109 Operate grinding Machines CSC/ N 0159 Perform assembly operations on metal components to make tools and dies CSC/ N 0135 Use basic health and safety practices at the workplace CSC/ N 0136 Work effectively with others **Optional:** 1. Nil
Performance Criteria	As described in the relevant OS units

Definitions

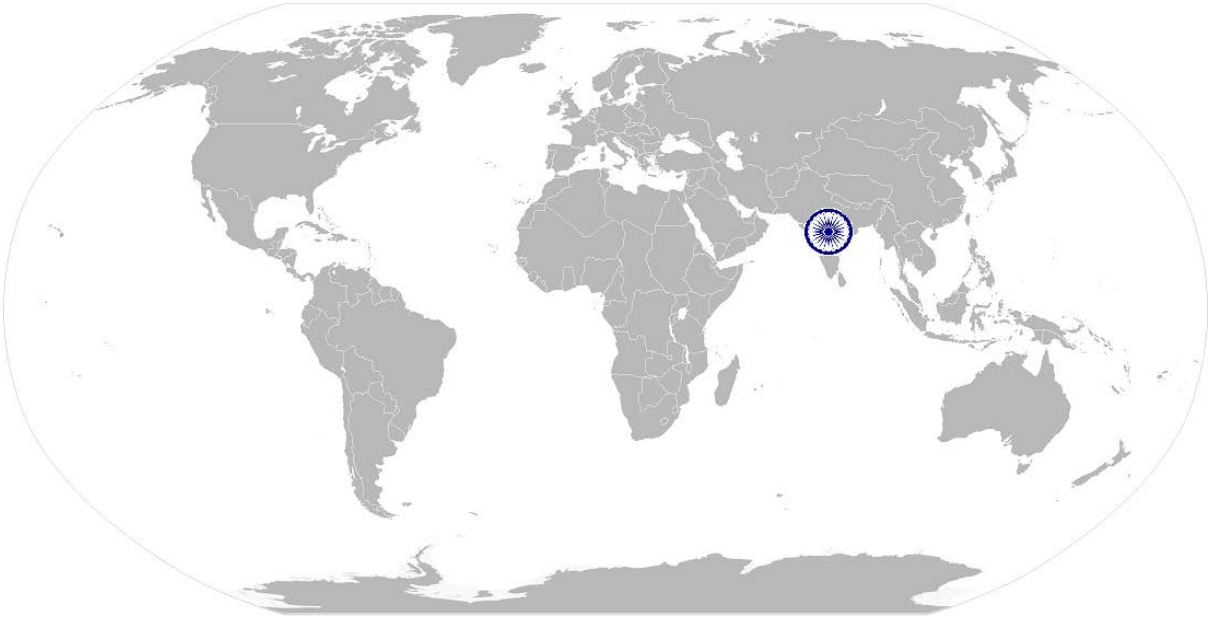
Keywords /Terms	Description
Core Skills/Generic Skills	Core Skills or Generic Skills are a group of skills that are key to learning and working in today's world. These skills are typically needed in any work environment. In the context of the NOS, these include communication related skills that are applicable 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
EDM	Electro Discharge Machine
CAD	Computer Aided Design

National Occupational Standard



Overview

This unit covers the planning and co-ordination for making of tools and dies as per given specifications. It involves understanding the tool and die design, identifying the sequence of operations required by studying their designs and co-ordination with other for the performance of required operations on the metal component.

CSC/ N 0158 **Plan and co-ordinate the making of tools and die**

National Occupational Standard

Unit Code	CSC/ N 0158
Unit Title (Task)	Plan and co-ordinate the making of tools and die
Description	This unit covers the planning and co-ordination for making of tools and dies as per given specifications. It involves understanding the tool and die design, identifying the sequence of operations required by studying their designs and co-ordination with other for the performance of required operations on the metal component. The candidate will determine the sequence of machining operations and equipment required to produce the end product in the most efficient manner. To do so, they use various techniques and machine -tools such as hand tools, manually operated machines, conventional drills, lathes, milling machines, grinders and saws, and computer numerical control (CNC) machines and Electrical Discharge Machines (EDM), etc. The candidate will further get the various operations done from the various operators and workers. The candidate will be expected to work unsupervised, on their own or as part of a team and may also be expected to lead or instruct a team, taking responsibility for own actions as well as the actions of the team and for the quality and accuracy of the work produced. The candidate will have knowledge and understanding of tool and die specific engineering principles and processes; basic engineering design principles; project planning and resource management techniques and about the various operations mentioned and their tools and equipment. The candidate will be required to have a good understanding of the safe working practices throughout as well as the appropriate legislative and regulatory frameworks applicable to their area of responsibility, ensuring that all safe working practices are maintained and the relevant norms and guidelines applicable are adhered to and will understand the responsibility they owe to themselves and others in the workplace.
Scope	This unit/task covers the following: Range of Materials: • Ferrous metals: eg. carbon steels, stainless steels, cast iron, tool steel, hard metals • Non-ferrous metals: eg. bronze, bronze alloys, copper and copper alloys Properties • plasticity • elasticity • ductility • malleability • toughness • hardness • tensile strength • compressive strength

- shear strength
- corrosion resistance
- density

Valid sources for job specifications are:

- job instruction sheet/job card
- work drawings and instructions
- planning documentation
- quality control documents
- operation sheets
- process specifications
- instructions from supervisor

Job specification documents are:

- detailed component drawings
- approved sketches/illustrations
- national, international and organisational standards
- reference tables and charts
- fabrication/casting drawings
- operational diagrams
- contractual specifications

Job requirements to be established are:

- 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 fabricated
- cutting, bending and rolling allowances for fabricated forms
- instruments and tools to be used
- interdependencies
- timelines

The various fitting activities to be carried out

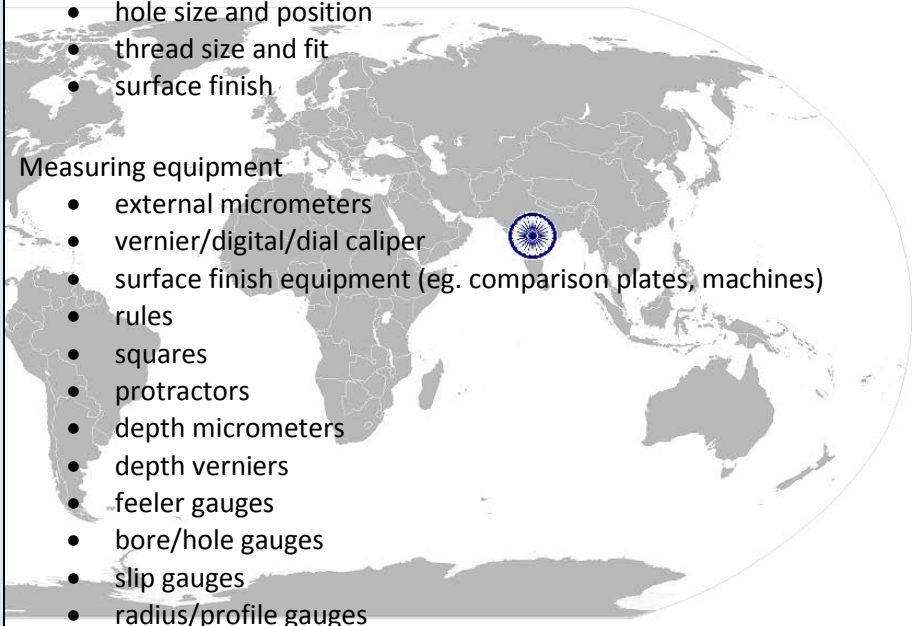
- measuring and marking out
- fabrication using hand tools
- fabrication using manually operated power tools(cutting, forming, grinding, drilling, threading, tapping, reaming, polishing, boring, etc)
- machining using conventional machine tools (milling, drilling, turning, grinding)
- machining using CNC machines (grinding, milling, turning, polishing, VMC, EDM, etc)
- inspection of finished products(visually, using measuring tools, using CMM machine)

Hand fitting methods

- cutting out the rough profile using saws (eg. hacksaw, band saw)
- cutting a screw thread (eg. tapping or dieing)
- filing (flat, square, curved)
- drilling holes
- tapping

Dimensional parameters are:

- linear dimensions (eg. lengths, depths)
- diameters (eg. external, internal)
- flatness
- squareness
- angles
- profiles
- hole size and position
- thread size and fit
- surface finish



Measuring equipment

- external micrometers
- vernier/digital/dial caliper
- surface finish equipment (eg. comparison plates, machines)
- rules
- squares
- protractors
- depth micrometers
- depth verniers
- feeler gauges
- bore/hole gauges
- slip gauges
- radius/profile gauges
- thread gauges
- height gauge
- hardness tester
- dial test indicators (DTI)
- surface roughness tester
- coordinate measuring machine (CMM)
- profile projectors

Workholding devices:

- bench / machine vice
- clamps (eg. toolmaker's)
- three-jaw chuck
- four-jaw chuck
- collet chuck
- drive plate and centres

CSC/ N 0158 **Plan and co-ordinate the making of tools and die**

- magnetic chucks(holding devices)
- special purpose tool holders (3R for holding electrodes)

Components quality standards as per the process:

- components to be free from false tool cuts, burrs and sharp edges
- dimensional tolerance +/-0.020mm
- flatness and squareness 0.05mm
- angles within +/- 1 degree
- screw threads to fit as per standard
- reamed and bored holes within interference: - 0.025mm (hole) + 0.025mm (shaft), transition: - 0.1mm (hole) + 0.1 (shaft) , clearance: 50microns
- radius: 0.5 r
- surface finish 63µin or 1.6 µm

Hazards associated with the activities:

- use of power tools, trailing leads or hoses, damaged or badly maintained tools and equipment
- using files with damaged or poor fitting handles
- using machine tools
- handling of oils and grease
- misuses of tools
- not following laid-down maintenance procedures

Features to be marked out are:

- datum lines
- cutting guidelines
- square and rectangular profiles
- circular and radial profiles
- angles
- holes linearly positioned, boxed and on pitch circles

The factors that affect the selection of cutting feeds and speeds, and the depth of cut that can be taken:

- type of material
- size of material
- operations being performed
- workholding method/security of workpiece
- condition of machine
- finish required
- tolerance required

Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**

CSC/ N 0158 **Plan and co-ordinate the making of tools and die**

Working safely	PC1. adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations PC2. ensure that all hand tools and equipment used are in a safe and useable condition PC3. ensure that all machine tools are correctly guarded at all times
Understanding design requirements and planning	PC4. obtain sample parts/ blueprints/ drawings of tools/ dies and other engineering information as per company procedures PC5. analyze sample parts, engineering drawings and blueprints to plan sequence of operations for tools & dies making PC6. report and rectify cases of inappropriate information in design documents as per organizational procedures PC7. compute dimensions, sizes, shapes and tolerances of sub-assemblies of the tools and dies as per specifications and as per company procedures PC8. determine information such as number of parts to make, engineered components and material to be used, and machines to be used PC9. identify the operations that will be required for tools & dies making based on design and blueprints PC10. identify type of equipment required for tools & dies making based on the operations selected PC11. establish the sequence of operations PC12. estimate timelines for each task accurately PC13. prioritize operations into a logical sequence PC14. establish milestones by determining a schedule of operations PC15. identify and confirm resources required such as components, machinery, materials and processes PC16. allocate responsibilities to machine operators as per the operations selected
Co-ordinating with others	PC17. release drawings and machining specifications to machine operators PC18. identify and select tools for tools & dies making based on design and blueprints PC19. identify and select lifting and rigging equipment based on design and blueprints PC20. select and procure appropriate metals to be used for tools & dies making as per design requirement PC21. hand over tools, equipment and metal components to be machined to the machine operators PC22. handle all clarifications sought by the operators PC23. collect job from all operators PC24. check the jobs as per drawing/instruction
Knowledge and Understanding (K)	

CSC/ N 0158 **Plan and co-ordinate the making of tools and die**

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. valid sources for information about job specifications KB2. various types of job specification documents KB3. how to extract and use information from engineering drawings and related specifications in relation to work undertaken KB4. how to interpret first and third angle drawings KB5. basic principles of tool and die design KB6. basic knowledge of accessing computer drawing software to be used for viewing designs drawings KB7. make minor modifications in the design drawings KB8. how to access the specific computer modelling software to be used KB9. how to set up the viewing screen to show multiple views of the component KB10. SI, FPS and metric systems of measurement KB11. geometric dimensioning and tolerancing -- GD&T KB12. how to plan and organize the team KB13. machine operations and sequencing KB14. machine capacity and capabilities KB15. types of machine tools such as lathes, drills, grinders, saws and milling machines KB16. work holding devices and equipment KB17. machining accessories KB18. limits and capabilities of tooling, accessories and holding devices KB19. how to check the workpiece and the measuring equipment that is used KB20. need to check that the measuring equipment is within current calibration dates, and that the instruments are correctly zeroed KB21. measuring internal and external dimensions KB22. measuring geometric features KB23. how to check surface finish KB24. properties of metals
Skills (S) [Optional]	
	Communication

CSC/ N 0158 **Plan and co-ordinate the making of tools and die**

A. Core Skills/ Generic Skills	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 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 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 SA8. identify and draw various basic, compound and solid shapes as per dimensions given SA9. use appropriate measuring techniques and units of measurement SA10. use appropriate units and number systems to express degree of accuracy SA11. interpret and express tolerance in terms of limits on dimensions SA12. calculation of the value of angles in a triangle
	Learning
	The user/individual on the job needs to know and understand how to: SA13. maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments SA14. participate in on-the-job and other learning, training and development interventions and assessment SA15. clarify task related information with appropriate personnel or technical adviser SA16. seek to improve and modify own work practices
B. Professional Skills	**Problem solving**
	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
	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

CSC/ N 0158 **Plan and co-ordinate the making of tools and die**

	SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Initiative and Enterprise
	The user/individual on the job needs to know and understand: SB12. importance and impact of initiative and enterprise for achieving better results for self, others and organization SB13. how to undertake and express new ideas and initiatives to others SB14. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB15. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB16. one's competencies can and should be applied in new and different situations and contexts to achieve more
	Self-Management
	The user/individual on the job needs to know and understand: SB17. importance of taking responsibility for own work outcomes SB18. importance of adherence to work timings, dress code and other organizational policies SB19. importance of following laid down rules, procedures, instructions and policies SB20. importance of exercising restraint while expressing dissent and during conflict situations SB21. how to avoid and manage distractions to be disciplined at work SB22. importance of time management for achieving better results
	Teamwork
	The user/individual on the job needs to know and understand how to: SB23. work in a team in order to achieve better results SB24. identify and clarify work roles within a team SB25. communicate and cooperate with others in the team SB26. seek assistance from fellow team members

NOS Version Control

NOS Code	CSC/ N 0158		
Credits(NVEQF/NVQF/NSQF) [*OPTIONAL*]	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	24/03/14
Industry Sub-sector	1. Machine Tools 2. Tools Dies And Press Tools 3. Plastic Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering	Last reviewed on	

CSC/ N 0160: Perform fitting operations on metal components for making tools and dies using hand tools and manually operated machines

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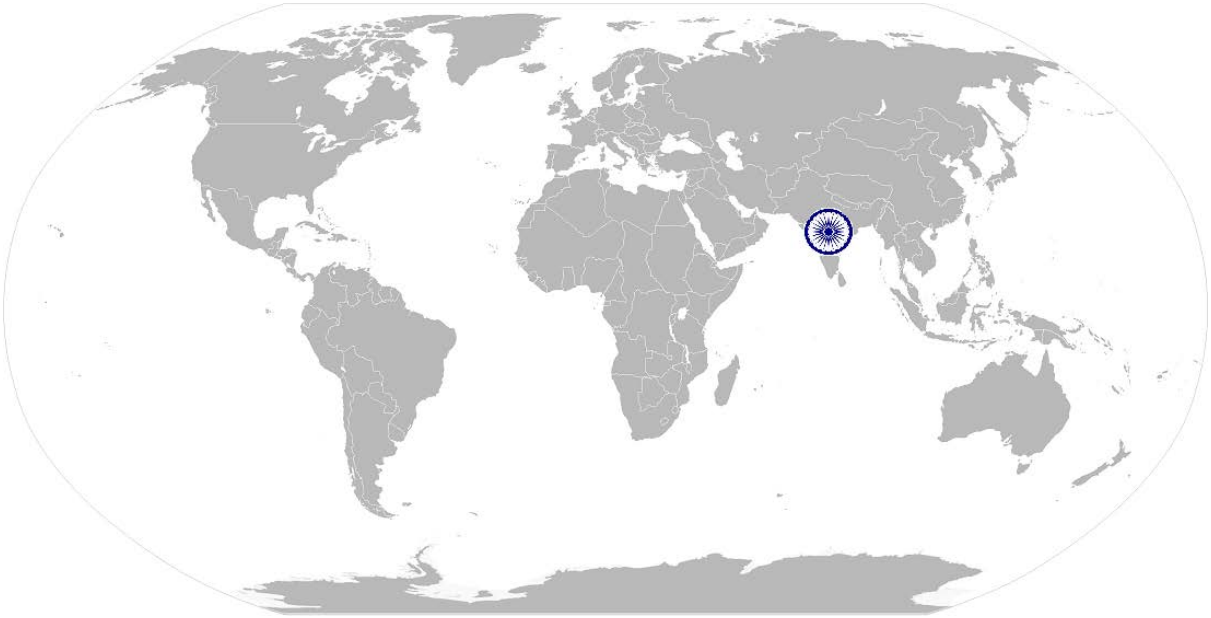
National Occupational Standard



Overview

This unit covers fitting of metal components for making tools and dies using hand tools and manually operated machines, to modify the shape of a component and/or generate components from raw material, as per given specifications.

CSC/ N 0160: Perform fitting operations on metal components for making tools and dies using hand tools and manually operated machines

National Occupational Standard

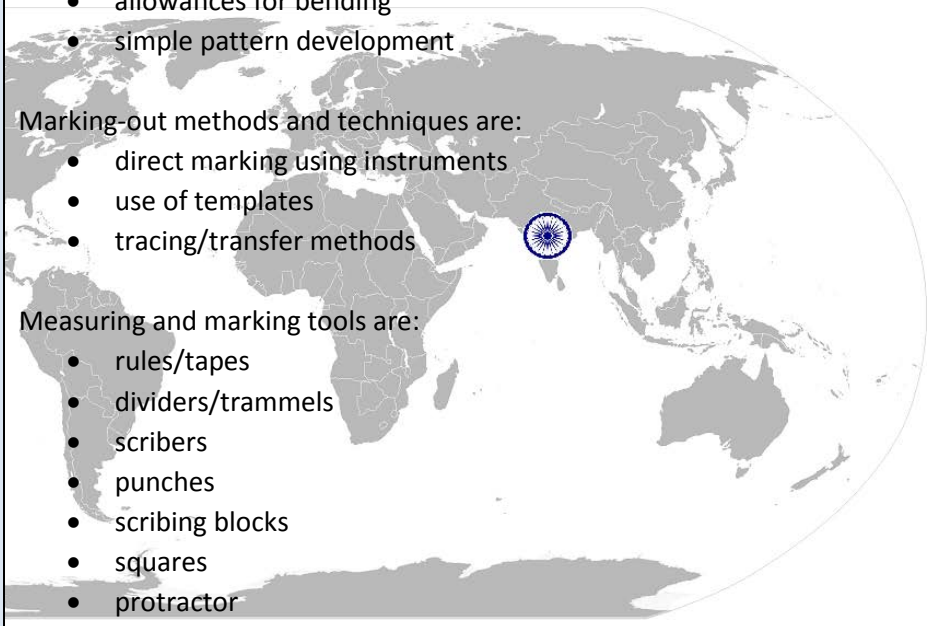
Unit Code	CSC / N 0160
Unit Title (Task)	**Perform fitting operations on metal components using hand tools and manually operated machines**
Description	This unit covers fitting of metal components for making tools and dies using hand tools and manually operated machines, to modify the shape of a component and/or generate components from raw material, as per given specifications. This involves carrying out the fitting operations like filing, drilling, chiseling, threading, tapping, scraping and manual lapping in order to fit a component as per specifications. It also involves inspecting the components after operations to ensure that the completed components are as per the required specification and to meet production targets. The candidate will be expected to perform as per instructions given, taking personal responsibility for their actions and for the quality and accuracy of the work that they produce. The candidate will have knowledge and understanding of the fitting operations used their applications, the equipment, materials and consumables used, the importance of quality and accuracy in their work and the safety precautions required. The candidate will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.
Scope	This unit/task covers the following: Valid sources for job specifications are: • job instruction sheet/job card • work drawings and instructions • planning documentation • quality control documents • operation sheets • process specifications • instructions from supervisor Job specification documents are: • detailed component drawings • approved sketches/illustrations • national, international and organisational standards • reference tables and charts • operational diagrams • contractual specifications Job requirements to be established are: • raw materials or components required (type, quality, quantity) • dimensions • limits and tolerances

CSC/ N 0160: Perform fitting operations on metal components for making tools and dies using hand tools and manually operated machines

- surface texture requirements
- operations required (list, sequence and procedures where applicable)
- shape or profiles to be machined
- instruments and tools to be used
- interdependencies
- timelines

Features to be marked out are:

- datum/centre lines
- lines (perpendicular, parallel)
- circles
- profiles (square/rectangular, radial, angles/angular)
- hole positions (radial, linear)
- allowances for bending
- simple pattern development



Marking-out methods and techniques are:

- direct marking using instruments
- use of templates
- tracing/transfer methods

Measuring and marking tools are:

- rules/tapes
- dividers/trammels
- scribers
- punches
- scribing blocks
- squares
- protractor
- depth/internal/external micrometers
- calipers (vernier, inside and outside, depth)
- gauges (height Vernier, feeler, bore/hole, slip, radius/profile, thread, plug)
- stick micrometers
- dial stand and comparator
- vee block with u-clamp

Range of Materials:

- Ferrous metals: eg. carbon steels, stainless steels, cast iron, tool steel, hard metals
- Non-ferrous metals: eg. bronze, bronze alloys, copper and copper alloys

CSC/ N 0160: Perform fitting operations on metal components for making tools and dies using hand tools and manually operated machines

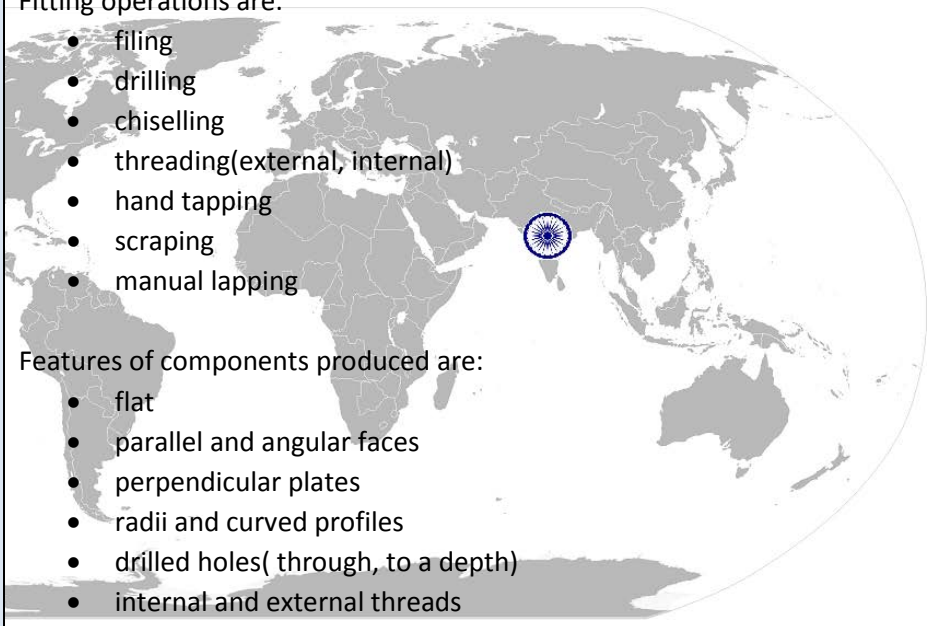
Forms of metal components are:

- square/rectangular (eg. bar stock, sheet material, machined components)
- circular/cylindrical (eg. bar stock, tubes, turned components, flat discs)
- sections (eg. angles, channel, tee section, joists, extrusions)
- irregular shapes/profile (eg. castings, forgings, odd shaped components)

Suitability of workpieces/materials and consumables include:

- correct type and code
- correct form
- correct dimensions
- damage free
- correctly issued

Fitting operations are:



- filing
- drilling
- chiselling
- threading(external, internal)
- hand tapping
- scraping
- manual lapping

Features of components produced are:

- flat
- parallel and angular faces
- perpendicular plates
- radii and curved profiles
- drilled holes(through, to a depth)
- internal and external threads
- sliding or mating parts
- counterbore, countersink, or spot face
- chamfers
- reamed holes
- faces which are square to each other
- faces which are parallel to each other

Hand tools used for fitting operations are:

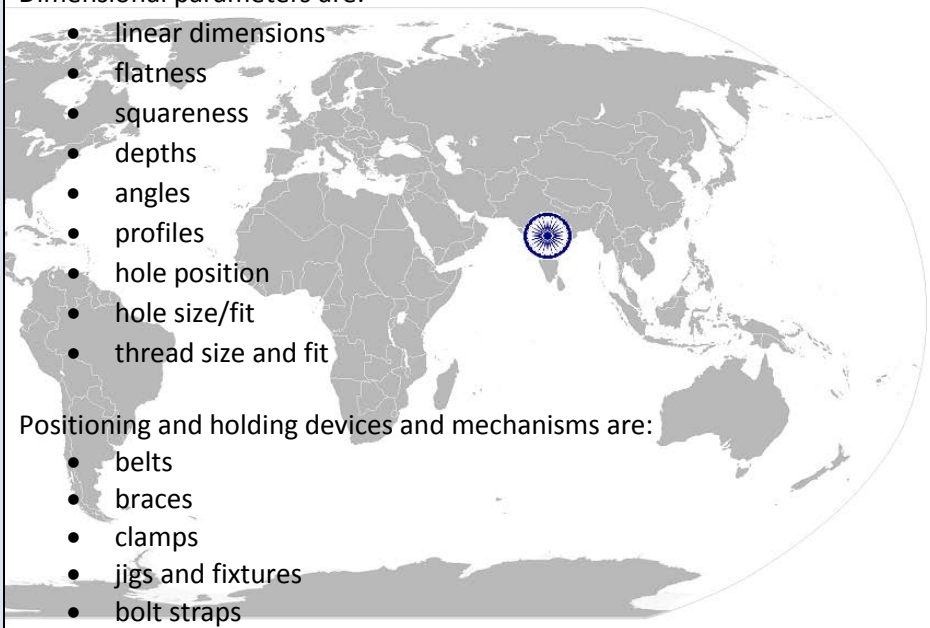
- hammers
- punches
- screwdrivers
- sockets
- wrenches

- spanners
- scrapers
- chisels
- gouges
- files
- taps
- vices and clamps

Manually operated machine tools used for fitting operations are:

- drills (power drills, pedestal drills)
- punching machines
- threading machines

Dimensional parameters are:



- linear dimensions
- flatness
- squareness
- depths
- angles
- profiles
- hole position
- hole size/fit
- thread size and fit

Positioning and holding devices and mechanisms are:

- belts
- braces
- clamps
- jigs and fixtures
- bolt straps
- blocks and tables
- manual lifts
- ropes
- jacks

Components quality standards as per the process:

- components to be free from damage, false tool cuts, burrs, scratches and non-specified sharp edges
- general dimensional tolerance +/- 0.020mm
- flatness and squareness 0.05mm
- angles within +/- 1 degree
- screw threads to fit as per standard
- reamed and bored holes within interference: - 0.025mm (hole) + 0.025mm

	(shaft), transition: - 0.1mm (hole) + 0.1 (shaft) , clearance: 50microns • radius: 0.5 r Documentation during and post operations are: • job card • progress records • incident reports Materials can be identified by: • colour • appearance • sparks Mechanical properties of metals are: • tensile strength • toughness • hardness • elasticity • ductility • malleability Range statements for numerical and computational ability are: • Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages • Units and number systems representing degree of accuracy: decimals places, significant figures, fractions as a decimal quantity • 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 • Angles in a triangle: right-angled, isosceles, equilateral
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working safely	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 fitting operations PC3. work following laid down procedures and instructions PC4. ensure work area is clean and safe from hazards PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition

CSC/ N 0160: Perform fitting operations on metal components for making tools and dies using hand tools and manually operated machines

Preparing for fitting operations	PC6. obtain job specification from a valid and approved source PC7. read and establish job requirements from the job specification document accurately PC8. report and rectify incorrect and inconsistent information in job specification documents as per organization procedures PC9. prepare the work area for the fitting operations as per procedure or operational specification PC10. ensure that all measuring equipment is calibrated and approved for usage PC11. ensure that the components used are free from foreign objects, dirt or other contamination PC12. obtain correct workpieces/raw materials and consumables as per job requirements PC13. obtain appropriate tools and equipment as per job requirements PC14. set work pieces as per job requirements using appropriate positioning and/or holding devices and support mechanisms
Marking components	PC15. mark out specified features on the workpieces as per job specification using appropriate measuring and marking out tools and equipment PC16. mark out templates for tracing/transferring the specified features on the workpieces as per job specification PC17. trace/transfer the specified features from the templates onto the workpieces as per job specification
Performing fitting operations	PC18. perform fitting operations on various forms of metal components using a range of hand tools and manually operated machines PC19. follow the specified fitting sequence and procedure as per job specifications PC20. interpret in-built fault indicators and error codes of equipment and respond to the same as per operating manual/organizational guidelines PC21. check the fitted products to ensure completeness of work PC22. check the quality of the output as per required standards, using visual checks and measurement of dimensional parameters PC23. produce components as per standards applicable to the process PC24. work to achieve production targets PC25. report conditions and seek appropriate assistance in a timely manner to address risk of failure to comply with necessary targets and specifications PC26. deal with finished components as per organizational guidelines PC27. complete documentation during and post operations as per organizational procedures PC28. return all tools and equipment to the correct location on completion of the fitting activities PC29. 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	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

its processes)	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, fitting procedures and environmental regulations that must be observed KB2. hazards associated with carrying out the fitting operations and how can they be minimized KB3. personal protective equipment to be used during the fitting activities and where can it be obtained KB4. types and sources of appropriate job specifications KB5. common terminology used in fitting KB6. importance of following specified fitting sequences and procedures KB7. importance and procedures of ensuring suitability of workpieces/materials and consumables for the specified job KB8. tools and equipment used for the fitting operations KB9. importance and procedures to ensure that tools and equipment are in a safe and usable condition KB10. correct techniques and procedures to carry out specific fitting operations by hand tools and manually operated machines KB11. importance of securing the workpiece/raw material correctly using appropriate devices and mechanisms KB12. common problems that can occur in the fitting operations and their implications KB13. correct procedures to address problems commonly encountered during fitting operations KB14. importance of reporting problems immediately and accurately KB15. meaning and importance of quality in relation to final and intermediate job output KB16. how to check the quality of the shaped components against the specified quality standards KB17. range of materials used in relevant fitting applications KB18. relevant mechanical properties of metals and implications for job KB19. importance of using correct procedures as per type and form of materials and metal components
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Communication**
	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

CSC/ N 0160: Perform fitting operations on metal components for making tools and dies using hand tools and manually operated machines

	to the job in English and/or local language 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 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 SA8. identify and draw various basic, compound and solid shapes as per dimensions given SA9. use appropriate measuring techniques and units of measurement SA10. use appropriate units and number systems to express degree of accuracy SA11. interpret and express tolerance in terms of limits on dimensions SA1. calculation of the value of angles in a triangle
	Learning
	The user/individual on the job needs to know and understand how to: SA12. maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments SA13. participate in on-the-job and other learning, training and development interventions and assessment SA14. clarify task related information with appropriate personnel or technical adviser SA2. seek to improve and modify own work practices
B. Professional Skills	**Problem solving**
	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
	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

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	Initiative and Enterprise
	The user/individual on the job needs to know and understand: SB12. importance and impact of initiative and enterprise for achieving better results for self, others and organization SB13. how to undertake and express new ideas and initiatives to others SB14. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB15. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB16. one's competencies can and should be applied in new and different situations and contexts to achieve more
	Self-Management
	The user/individual on the job needs to know and understand: SB17. importance of taking responsibility for own work outcomes SB18. importance of adherence to work timings, dress code and other organizational policies SB19. importance of following laid down rules, procedures, instructions and policies SB20. importance of exercising restraint while expressing dissent and during conflict situations SB21. how to avoid and manage distractions to be disciplined at work SB22. importance of time management for achieving better results
	Teamwork
	The user/individual on the job needs to know and understand how to: SB23. work in a team in order to achieve better results SB24. identify and clarify work roles within a team SB25. communicate and cooperate with others in the team SB26. seek assistance from fellow team members

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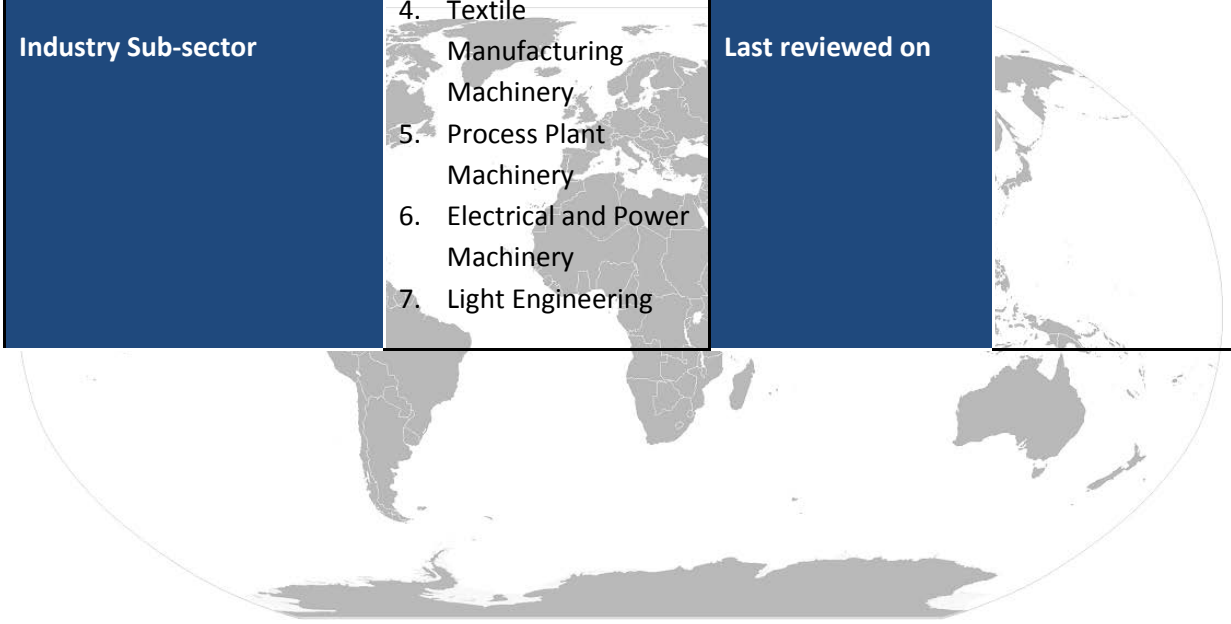
NOS Version Control

NOS Code	CSC/ N 0160		
Credits(NSQF)[*OPTIONAL*]	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	24/03/14
Industry Sub-sector	1. Machine Tools 2. Tools Dies And Press Tools 3. Plastic Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering	Last reviewed on	



CSC/ N 0102 Grind surface using hand and/or hand-held power tools

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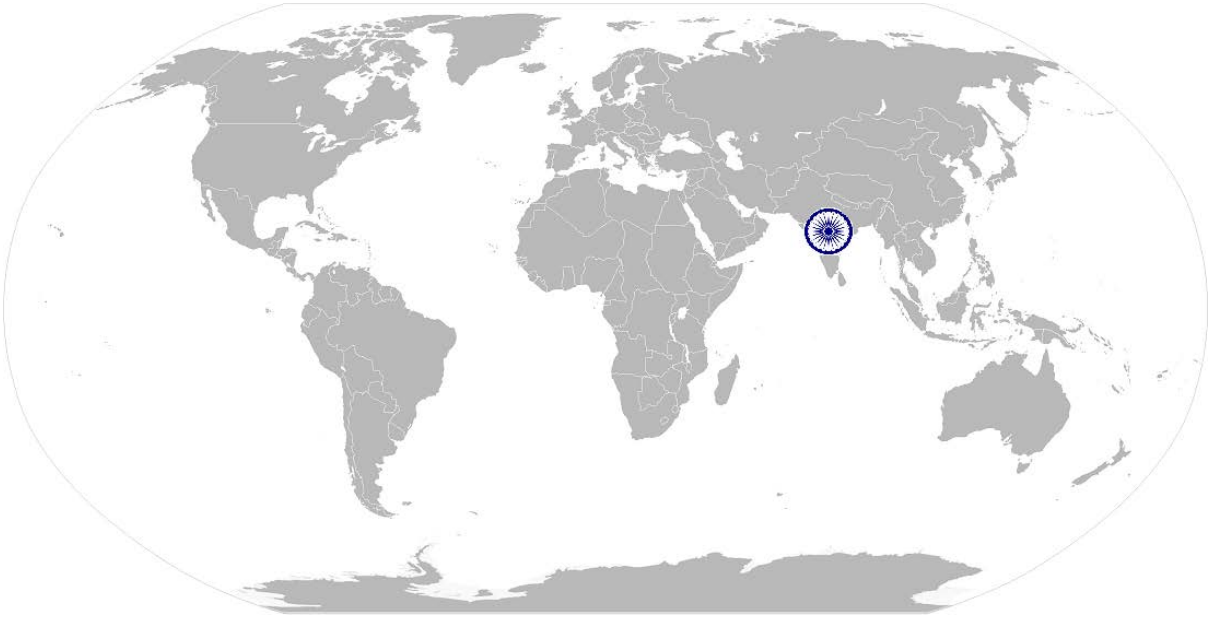
National Occupational Standard



Overview

This unit covers competencies required for grinding surface using hand tools and/or hand-held power tools on a variety of ferrous and non-ferrous materials and components.

CSC/ N 0102 Grind surface using hand and/or hand-held power tools

National Occupational Standard

Unit Code	**CSC/ N 0101**
Unit Title (Task)	**Grind surface using hand and/or hand-held power tools**
Description	This unit covers competencies required for grinding surface using hand tools and/or hand-held power tools on a variety of ferrous and non-ferrous objects. This involves selecting appropriate grinding equipment, tools and methods to suit work requirements; It also includes preparing the tools, applying grinding procedures with these tools for carrying out the grinding operations. It also involves inspecting the components after grinding operations and correcting faults to ensure that the grinding and surface finish is as per the required specification. The candidate will be expected to perform as per instructions given, take responsibility for own actions and for the quality and accuracy of the work produced. The candidate will have knowledge and understanding of the hand and hand-held power tools, equipment, materials and consumables used; various kinds of grinding tools and their applications, grinding operations and procedures; the importance of quality and accuracy in the work and the safety precautions required. The candidate will be required to demonstrate safe working practices throughout, and will understand responsibility they owe to themselves and others in the workplace.
Scope	This unit/task covers the following: Valid sources for job specifications are: • job instruction sheet/job card • work drawings and instructions • planning documentation • quality control documents • process specifications • standard operating procedures • instructions from supervisor Job requirements to be established are: • raw materials or components required (type, quality, quantity) • dimensions and surface texture requirements • limits and tolerances • operations required(list, sequence and procedures where applicable) • timelines Different types of power tools determined by their power source are: • electric • pneumatic

	• liquid fuel • hydraulic Different kinds of Grinders are: • angle grinders • bench grinders • straight grinder • rotary die grinders • disc grinder • electronic grinder/ • electric or pneumatic/hydraulic grinders • pedestal grinders • cylindrical grinders Kinds of discs used for various materials are: • cut-off discs (diamond blade) • abrasive grinding discs • grinding stones • wire brush wheels Range of Materials used are: • ferrous metals: eg. carbon steels, stainless steels, cast iron, tool steel, hard metals • non-ferrous metals: eg. bronze, bronze alloys, copper and copper alloys Parameters to be checked for finishing are: • texture • roughness Documentation during and post operations are: • job card • progress records • incident reports
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working safely	PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work and ensure process compliance PC2. adhere to procedures or systems in place for risk assessment, occupational standards, personal protective equipment (PPE) and other relevant occupational safety regulations PC3. work following laid down procedures and instructions PC4. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition and are kept at secured location

	PC5. ensure work area is clean and safe from hazards before and after the job is completed
Preparing for grinding operations	PC6. obtain job specification from a valid and approved source PC7. ensure that all measuring equipment are within calibration date and are approved for usage PC8. read and establish job requirements from the job specification document accurately PC9. report and rectify incorrect and inconsistent information in job specification documents as per organization procedures PC10. prepare the work area for the grinding operations as per procedure PC11. obtain correct work-pieces/raw materials and consumables as per job requirements PC12. identify the metals, metal alloys and non-metals accurately PC13. interpret surface finish specifications accurately PC14. select grinding method/technique as per the work requirements PC15. obtain appropriate tools and equipment per job requirements
Grinding Objects	PC16. set work pieces as per job requirements using appropriate positioning and/or holding devices PC17. measure and mark equipment, objects, or parts to ensure grinding standards are met PC18. trim or scrape objects or parts, using chisels, scrapers, and other hand or power tools and equipment PC19. select stones, wheels, files or other abrasives, according to materials, sizes and shapes of work-pieces, amount of stock to be removed, finishes specified, and steps in finishing and grinding processes PC20. move controls to adjust, start, or stop equipment during grinding process PC21. load and adjust work-pieces onto equipment or work tables PC22. carry out the grinding process using and/or tools or hand-held power tools in accordance with standard operating procedures PC23. finish job surface to specification according to requirement PC1. perform wheel dressing using diamond cutter PC24. check the surface finish of the object on which grinding is done to ensure completeness of work PC25. identify common surface imperfections and correct errors PC26. ensure that the work-piece achieves the required characteristics and meets the finishing specification PC27. complete documentation post completion of work, as per procedure PC28. secure tools and equipment in a safe condition on completion of the processing activities PC29. determine the kind of tools and equipment needed to do a job or repair the tools PC30. perform routine maintenance on equipment and determining when and what kind of maintenance is needed

CSC/ N 0102 Grind surface using hand and/or hand-held power tools

Handling of unresolved problems	PC31. refer unresolved job related problems to appropriate personnel for support PC32. monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem
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. relevant 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. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities KA4. reporting structure, inter-dependent functions, lines and procedures in the work area KA5. how to engage with specialists for support in order to resolve incidents and service requests KA6. importance of working in clean and safe environment practices and procedures KA7. relevant people and their responsibilities within the work area KA8. escalation matrix and procedures for reporting work and employment related issues KA9. documentation and related procedures applicable in the context of employment and work
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. kinds of common ferrous and non-ferrous metals KB2. hand tool (powered and unpowered) grinding methods & techniques and terminology used in grinding procedures; which tools to use and when KB3. hand and held-held power tools and equipment to be used in grinding for different types of material KB4. application of hand and powered tools and how to ensure that powered tools are set up, used and closed down safely. KB5. procedures, tools and techniques required to set operational performance parameters KB6. reasons for selecting a specific tool, method or technique for grinding operations KB7. correct procedures of tools and equipment usage for the grinding operations KB8. effect of different types and grades of grinding achievable by various tools to achieve required surface finish KB9. importance of following specified grinding sequence and procedures KB10. types and sources of appropriate job specifications KB11. suitability of work-pieces/materials and consumables for the specified job, its importance and procedures KB12. securing the work-piece/raw material correctly using appropriate tools and mechanisms KB13. various types of substrate that may require preparing and the types of tools and preparation methods that may be used on them KB14. why different types of substrate require different preparation techniques to be used and the damage that may result from using inappropriate tools and techniques

	KB15. how to identify grinding process faults, methods and techniques to check for common surface imperfections/defects and conformance to specifications KB16. surface imperfections/defects that can be removed/repaired KB17. procedures for handling components with surface imperfections/defects that cannot be removed/repaired and how can they be minimized KB18. importance of tools and equipment being kept in a safe and usable condition KB19. hazards associated with carrying out the grinding process KB20. personal protective equipment (PPE) and clothing that must be worn during the grinding activity and from where can it be obtained KB21. importance of the maintenance of a register of power tools, and the need to check tools against certification KB22. importance of completing the production documentation throughout the grinding process
Skills (S) [Optional]	
A. Core Skills/ Generic Skills **B.**	**Communication Skills**
	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 SA2. check and clarify task-related information SA3. liaise with appropriate authorities using correct protocol SA4. convey and share technical information clearly using appropriate language SA5. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language 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 SA8. identify and draw various basic, compound and solid shapes as per dimensions given SA9. use appropriate measuring techniques and units of measurement SA10. use appropriate units and number systems to express degree of accuracy
	Learning
	The user/individual on the job needs to know and understand how to: SA11. maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments SA12. participate in on-the-job and other learning, training and development interventions and assessment SA13. clarify task related information with appropriate personnel or technical adviser SA14. seek to improve and modify own work practices
C. Professional Skills	**Problem Solving**
	The user/individual on the job needs to know and understand how to: SB1. identify problems with work planning, procedures, output and behavior and

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	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
	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
	Numerical and computation skills
	The user/individual on the job needs to know and understand how to: SB12. use appropriate measuring techniques SB13. use arithmetic to carry out basic calculations
	Initiative and Enterprise
	The user/individual on the job needs to know and understand: SB14. importance and impact of initiative and enterprise for achieving better results for self, others and organization SB15. how to undertake and express new ideas and initiatives to others SB16. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB17. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB18. one's competencies can and should be applied in new and different situations and contexts to achieve more
	Self-Management
	The user/individual on the job needs to know and understand: SB19. importance of taking responsibility for own work outcomes SB20. importance of adherence to work timings, dress code and other organizational policies SB21. importance of following laid down rules, procedures, instructions and policies SB22. importance of exercising restraint while expressing dissent and during conflict situations SB23. how to avoid and manage distractions to be disciplined at work SB24. importance of time management for achieving better results
	Teamwork
	The user/individual on the job needs to know and understand how to: SB25. work in a team in order to achieve better results SB26. identify and clarify work roles within a team SB27. communicate and cooperate with others in the team SB28. seek assistance from fellow team members

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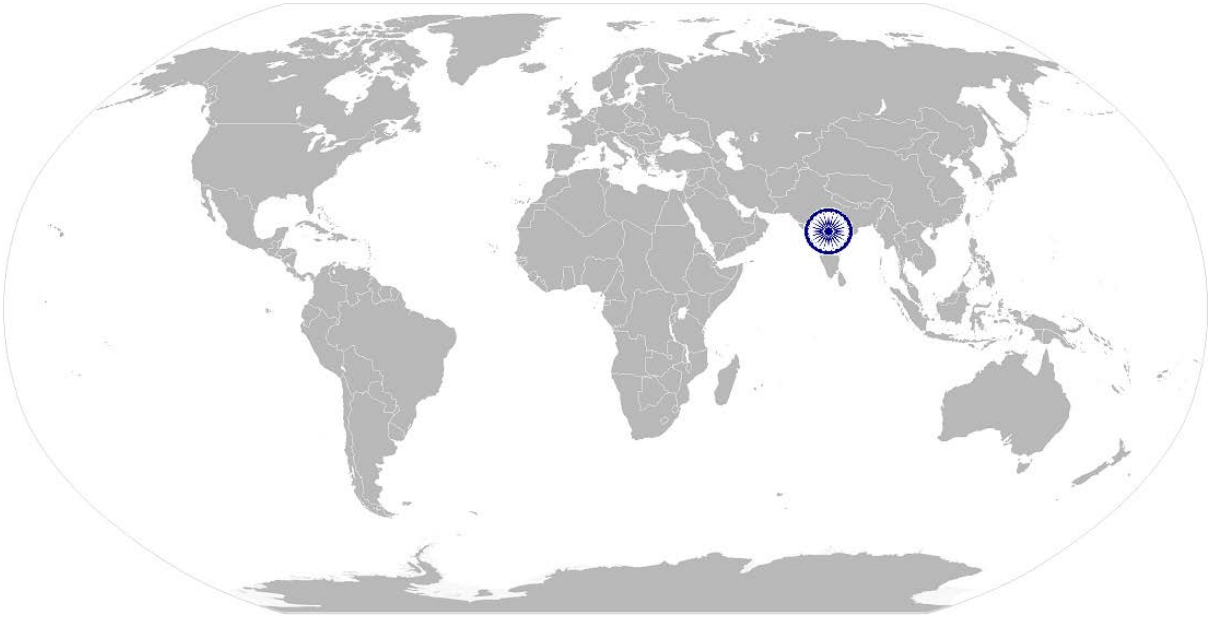
NOS Version Control

NOS Code	**CSC/ N 0102**		
Credits(NVEQF/NVQF/NSQF) [*OPTIONAL*]	**TBD**	**Version number**	**1.0**
Industry	**CAPITAL GOODS**	**Drafted on**	**14/03/14**
Industry Sub-sector	1. Machine Tools 2. Tools Dies And Press Tools 3. Plastic Manufacturing Machinery 4. Textile Manufacturing Machinery **5.** Process Plant Machinery **6.** Electrical and Power Machinery **7.** Light Engineering	**Last reviewed on**	
		Next review date	**24/03/14**

National Occupational Standard



Overview

This unit covers producing a range of components or performing machining by carrying out milling operations on a milling machine.

CSC/ N 0107 : Operating Conventional milling machines

National Occupational Standard

Unit Code	CSC/ N 0107
Unit Title (Task)	Operating Conventional milling machine
Description	This unit covers performing milling operations on a milling machine, to produce a range of components that combine a number of different features (eg. flat faces, parallel faces, faces that are flat and square to each other, angular faces, steps, slots and special forms). This will involve carrying out the operating a milling machine, in accordance with approved procedures, continuously monitor the machining operations and, where necessary, make minor adjustments to settings to make changes, in order to ensure that the work output is to the required quality and accuracy. The candidate will be expected to work as per instructions given, taking personal responsibility for own actions and for the quality and accuracy of the work that they produce. The candidate will understand the safety precautions required when working with the machine, its associated tools and equipment. The candidate will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace
Scope	This unit/task covers the following: Valid sources for job specifications are: • job instruction sheet/job card • work drawings and instructions • planning documentation • quality control documents • operation sheets • process specifications • instructions from supervisor Job specification documents are: • detailed component drawings • approved sketches/illustrations • national, international and organisational standards Confirm the equipment is set or ready by checking the following: • using the appropriate documentation • procedures or systems in place for risk assessment • personal protective equipment • confirm with the machine setter that the machine is ready for production • seek any necessary instruction/training on operation of the machine • check that machine guards are in place and are correctly adjusted

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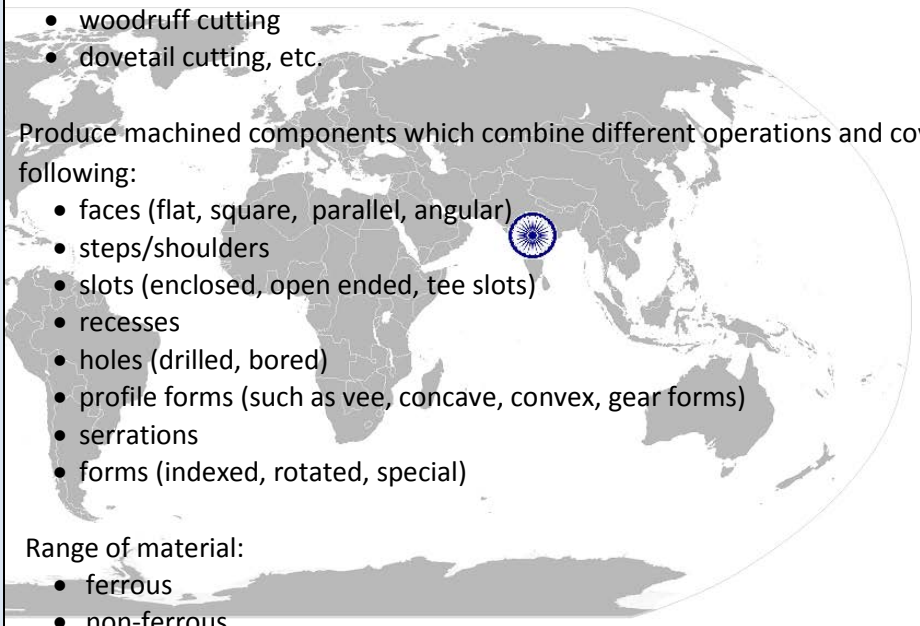
Different milling machine used are:

- horizontal milling machine
- vertical milling machine

Milling operations:

- milling of flat services
- gang and straddle milling
- milling of sunk and recessed surfaces
- face milling
- side milling
- angular milling
- slotting
- slitting
- key way cutting
- face slot cutting
- woodruff cutting
- dovetail cutting, etc.



Produce machined components which combine different operations and cover the following:

- faces (flat, square, parallel, angular)
- steps/shoulders
- slots (enclosed, open ended, tee slots)
- recesses
- holes (drilled, bored)
- profile forms (such as vee, concave, convex, gear forms)
- serrations
- forms (indexed, rotated, special)

Range of material:

- ferrous
- non-ferrous
- non-metallic

Components quality standards as per the process are:

- components to be free from false tool cuts, burrs and sharp edges
- dimensional tolerance 0.020 to 0.030 mm
- flatness and squareness within 0.125mm
- surface finish 63µin or 1.6µm
- angles within +/- 1 degree

Dimensional parameters are:

- dimensions
- squareness
- hole size/fit
- angles

	• flatness • surface finish • slots • recesses Checking equipment: • tri-square • bevel protractor • vernier caliper • micrometers (internal, external, depth) • height gauge • spring caliper, etc.
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working safely	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 fabrication and fitting operations PC3. work following laid down procedures and instructions PC4. ensure work area is clean and safe from hazards PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition
Preparing for operating conventional milling machine	PC6. check that all measuring equipment is within calibration date PC7. ensure that the components used are free from foreign objects, dirt or other contamination PC8. ensure availability of job specification from a valid source PC9. read and establish job requirements from the job specification document PC10. prepare and maintain the work area as per procedure or operation specification PC11. confirm with the machine setter that the machine is ready for production PC12. seek any necessary instruction/training on the operation of the machine, where appropriate PC13. ensure that machine guards are in place and are correctly adjusted PC14. identify different types of cutters used in horizontal and vertical milling machines PC15. identify different parts of the vertical and horizontal milling machine PC16. hold components securely, without distortion PC17. ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy

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Carrying out operations on conventional milling machine	PC18. obtain the component drawings, specifications and/or job instructions required for the components to be machined PC19. use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate IS or ISO standards in relation to work undertaken) PC20. operate the machine controls in both hand and power modes PC21. stop the machine in both normal and emergency situations, and use correct procedure for restarting after an emergency PC22. use imperial and metric systems of measurement PC23. perform milling operations with use of various methods and equipment PC24. overcome the effects of backlash in machine slides and screws PC25. apply roughing and finishing cuts considering the effect on tool life, surface finish and dimensional accuracy PC26. apply of cutting fluids with regard to a range of different materials PC27. clamp the work piece in a chuck/work holding device PC28. ensure that the quality control procedures are used on the equipment PC29. use range of equipment to check quality parameters
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. where personal protective equipment to be worn can be obtained KB2. hazards associated with the milling operations and how they can be minimized KB3. importance of keeping the work area clean and tidy KB4. where to obtain the component drawings, specifications and/or job instructions required for them components to be machined KB5. how to use imperial and metric systems of measurement KB6. main features of the centre lathes and the accessories that can be used (eg. saddle, compound slide, tailstock, taper turning attachments, profile attachments, fixed and travelling steadies) KB7. purpose and applications of milling KB8. tool materials (classification, properties and use)

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	KB9. different types of milling cutters and their uses KB10. various milling operations that can be performed, and the methods and equipment used KB11. horizontal and vertical milling operations KB12. processes of milling (up milling, down milling, face milling, end milling, etc.) KB13. effects of backlash in machine slides and screws, and how this can be overcome KB14. effects of clamping the workpiece in a chuck/workholding device, and how this can cause distortion in the finished components KB15. how to recognize machining faults and how to identify when tools need re-sharpening KB16. problems that can occur with the milling activities, and how these can be overcome KB17. extent of their own authority and to whom they should report if they have problems that they cannot resolve. KB18. safe working practices and environmental regulations that must be observed KB19. importance of reporting problems in a timely manner
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Communication**
	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 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 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 SA8. identify and draw various basic, compound and solid shapes as per dimensions given SA9. use appropriate measuring techniques and units of measurement SA10. use appropriate units and number systems to express degree of accuracy SA11. interpret and express tolerance in terms of limits on dimensions SA12. calculation of the value of angles in a triangle
	Learning

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	The user/individual on the job needs to know and understand how to: SA9. assess and modify own work practices SA10. use manuals, online help and other reference materials such as catalogues/lists as required SA11. maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments SA12. participate in on the job and other training interventions and assessment SA13. clarify task related information with appropriate personnel or technical adviser
B. Professional Skills	**Problem Solving**
	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
	The user/individual on the job needs to know and understand: 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
	Initiative and Enterprise
	The user/individual on the job needs to know and understand how to: SB12. importance and impact of initiative and enterprise for achieving better results for self, others and organization SB13. how to undertake and express new ideas and initiatives to others SB14. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB15. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB16. one's competencies can and should be applied in new and different situations and contexts to achieve more
	Self-Management
	The user/individual on the job needs to know and understand: SB17. importance of taking responsibility for own work outcomes SB18. importance of adherence to work timings, dress code and other organizational policies SB19. importance of following laid down rules, procedures, instructions and policies SB20. importance of exercising restraint while expressing dissent and during conflict situations

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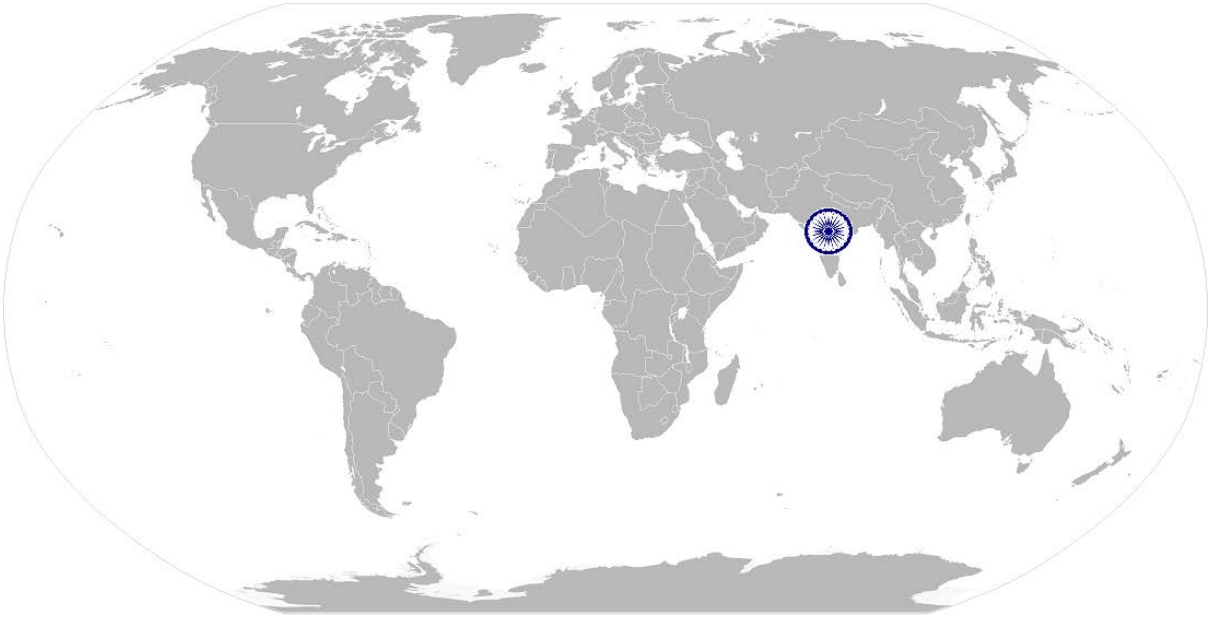
	SB21. how to avoid and manage distractions to be disciplined at work SB22. importance of time management for achieving better results
	Team Work
	The user/individual on the job needs to know and understand how to: SB23. work in a team in order to achieve better results SB24. identify and clarify work roles within a team SB25. communicate and cooperate with others in the team SB26. seek assistance from fellow team members



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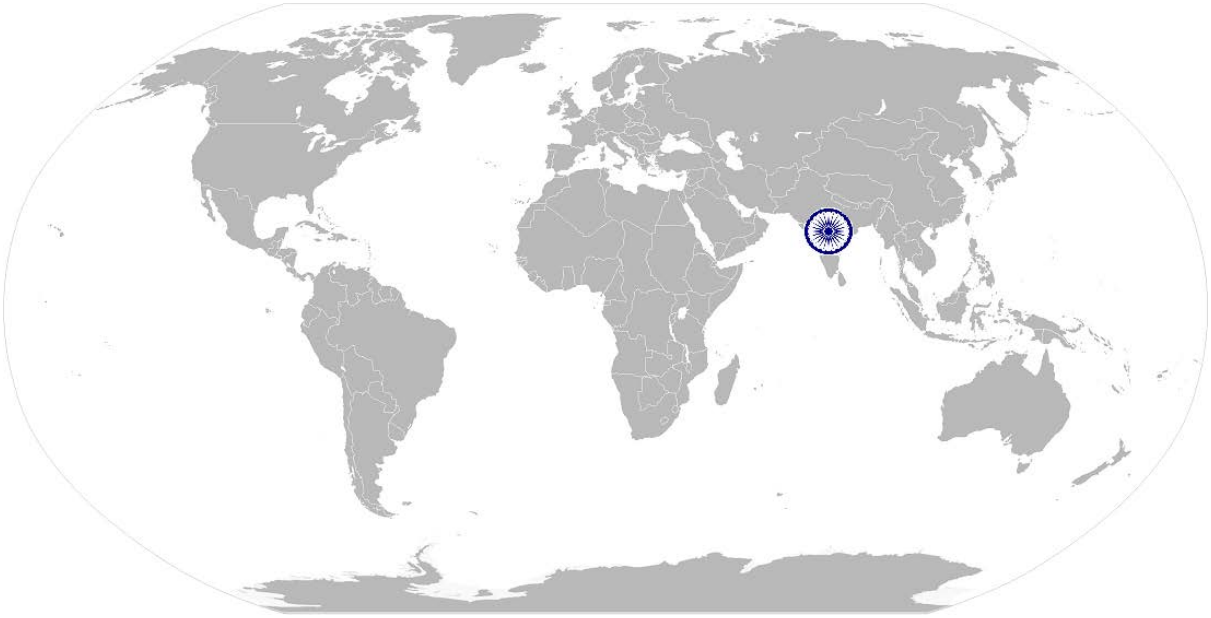
NOS Version Control

NOS Code	**CSC/ N 0107**		
Credits(NVEQF/NVQF/NSQF) [*OPTIONAL*]	**TBD**	**Version number**	**1.0**
Industry	**Capital Goods**	**Drafted on**	**14/03/14**
Industry Sub-sector	1. Machine Tools 2. Tools Dies And Press Tools 3. Plastic Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering	**Last reviewed on**	
		Next review date	**24/03/14**

National Occupational Standard



Overview

This unit is covers producing a range of components that combine different features by carrying out turning operations on different turning machines (eg. turret lathes, automatic or other specific turning machines).

CSC/ N 0108 : Operating conventional turning machines

National Occupational Standard

Unit Code	CSC/ N 0108
Unit Title (Task)	Operating conventional turning machines
Description	This unit is covers performing turning operations on machines such as centre lathes, capstan or turret lathes, automatic or other specific turning machines, to produce a range of components that combine a number of different features (eg. parallel, stepped and tapered diameters, drilled, bored and reamed holes, internal and external threads, and special forms/profiles). The candidate needs to prepare for the turning activities by obtaining all the necessary information, documentation, tools and equipment required, and to plan how they intend to carry out the required turning activities and the sequence of operations they intend to use. This will involve carrying out turning operations, in accordance with approved procedures, checking the quality of the workpiece using appropriate measuring equipment and the tolerances achieved. The candidate will be expected to work as per instructions given, taking personal responsibility for own actions and for the quality and accuracy of the work that they produce. The candidate will understand the safety precautions required when working with the machine, its associated tools and equipment. The candidate will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.
Scope	This unit/task covers the following: Personal protective equipment: • correctly fitting overalls • safety glasses • long hair is tied back or netted • removing any jewelry or other items that can become entangled in the machinery • covered shoes Valid sources for job specifications are: • job instruction sheet/job card • work drawings and instructions • planning documentation • quality control documents • operation sheets • process specifications • instructions from supervisor

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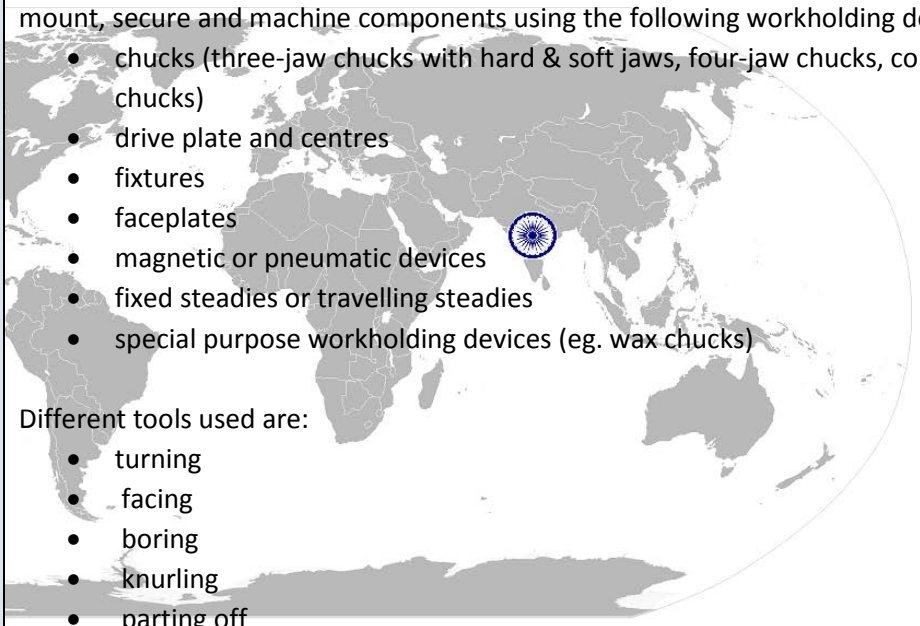
Job specification documents are:

- detailed component drawings
- approved sketches/illustrations
- national, international and organisational standards

Range of materials:

- low carbon/mild steel
- high carbon steel
- aluminum/aluminum alloys
- cast iron
- brass/brass alloys
- plastic/nylon/composite
- other specific material

mount, secure and machine components using the following workholding devices:



- chucks (three-jaw chucks with hard & soft jaws, four-jaw chucks, collet chucks)
- drive plate and centres
- fixtures
- faceplates
- magnetic or pneumatic devices
- fixed steadies or travelling steadies
- special purpose workholding devices (eg. wax chucks)

Different tools used are:

- turning
- facing
- boring
- knurling
- parting off
- forming
- recessing/grooving
- chamfering
- centre drills
- twist/core drills
- reamers
- taps
- thread forming tools
- dies

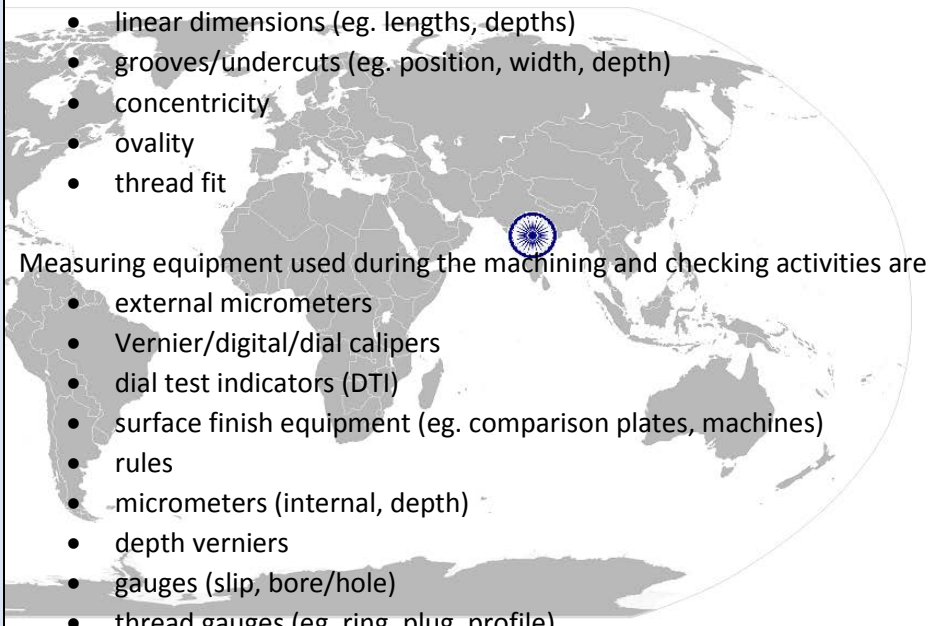
Machined components features:

- flat faces
- diameters (parallel, stepped, tapered, eccentric)

- holes (drilled, reamed, bored)
- chamfers
- grooves/undercuts
- profile forms
- threads (internal, external)
- parting off
- knurls or special finishes

Dimensional parameters are:

- diameters (external, internal, eccentricity
- parallelism
- bore/hole size/fit
- angle/taper
- surface finish
- linear dimensions (eg. lengths, depths)
- grooves/undercuts (eg. position, width, depth)
- concentricity
- ovality
- thread fit



Measuring equipment used during the machining and checking activities are:

- external micrometers
- Vernier/digital/dial calipers
- dial test indicators (DTI)
- surface finish equipment (eg. comparison plates, machines)
- rules
- micrometers (internal, depth)
- depth verniers
- gauges (slip, bore/hole)
- thread gauges (eg. ring, plug, profile)
- gauges (plug, radius/profile)
- protractors
- coordinate measuring machine (CMM)

Components quality standards as per the process are:

- components to be free from false tool cuts, burrs and sharp edges
- general dimensional tolerance +/- 0.25mm or +/- 0.010”
- there must be one or more specific dimensional tolerances within +/- 0.1mm or +/- 0.004”
- surface finish 63 µin or 1.6µm
- reamed holes within H8
- screw threads medium fit
- angles within +/- 0.5 degree

CSC/ N 0108 : Operating conventional turning machines

Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working safely	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 turning operations PC3. ensure work area is clean and safe from hazards PC4. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition PC5. ensure that machine guards are in place and are correctly adjusted
Preparing for operating conventional turning machine	PC6. check that all measuring equipment is within calibration date PC7. ensure availability of job specification from a valid source PC8. read and establish job requirements from the job specification document PC9. ensure that the components used are free from foreign objects, dirt or other contamination PC1. prepare and maintain the work area as per procedure or operation specification PC2. plan to carry out the required turning activities and the sequence of operations as per specifications PC3. follow the defined operating procedures and apply safe working practices and procedures at all times PC4. obtain all the appropriate materials, tools and equipment required for the turning operation PC5. confirm with the machine setter that the machine is ready for production PC6. prepare for the turning activities by mounting, positioning and correctly setting a range of workholding devices PC7. seek any necessary instruction/training on the operation of the machine, where required PC8. hold components securely, without distortion PC9. ensure that machine settings are adjusted as and when required (either by themselves or the setter) to maintain the required accuracy

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Carrying out operations on conventional turning machine	PC10. obtain the component drawings, specifications and/or job instructions required for the components to be machined PC11. use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate IS or ISO standards in relation to work undertaken) PC12. set and adjust the machine tool speeds and feeds to achieve the component specification PC13. mount and set the required workholding devices, workpiece and cutting tools PC14. operate the machine tool controls safely and correctly, in line with operational procedures PC15. control the machine in both hand and power modes for normal operations PC16. stop the machine in both normal and emergency situations correctly, and follow right procedure for restarting after an emergency PC17. use lathes and the accessories that consists of saddle, capstan/turret head, compound slide, tailstock, taper turning attachments, profile attachments, fixed and travelling steadies. PC18. position and secure workholding devices to the machine spindle PC19. line up the workholding device location with those on the machine spindle PC20. perform turning operations with use of various methods and equipment such as solid high-speed tooling, brazed tip tooling, interchangeable tipped tooling PC21. overcome the effects of backlash in machine slides and screws PC22. perform the technique of trial cut for checking dimensional accuracy PC23. apply roughing and finishing cuts, considering the effect on tool life, surface finish and dimensional accuracy PC24. apply of cutting fluids with regard to a range of different materials PC25. measure the internal and external dimensions, geometric features, surface finish by using the appropriate measuring equipment PC26. clamp the work piece in a chuck/work holding device PC27. perform the checks to be carried out on the components before removing them from the machine, and the equipment needed for this activity PC28. ensure that the quality control procedures are used while operating the equipment
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. where personal protective equipment to be worn can be obtained KB2. where to obtain the component drawings, specifications and/or job instructions required for them components to be machined KB3. hazards associated with the turning operations and how they can be minimized KB4. meaning and purpose of turning KB5. safety mechanisms on the machine, and the procedure for checking that they function correctly KB6. how to tighten all the bolts, cam locks or other securing devices securely KB7. importance of keeping the work area clean and tidy KB8. how to use imperial and metric systems of measurement KB9. main features of the lathes and the accessories that can be used such as saddle, capstan/turret head, compound slide, tailstock, taper turning attachments, profile attachments, fixed and travelling steadies) KB10. classification and purpose of various accessories KB11. tool materials (classification, properties and use) KB12. how to identify the factors that affect the selection of cutting feeds and speeds, and the depth of cut that can be taken KB13. various turning operations that can be performed, and the methods and equipment used KB14. effects of backlash in machine slides and screws, and how this can be overcome KB15. types of cutting fluids and their properties KB16. effects of clamping the workpiece in a chuck/workholding device, and how this can cause distortion in the finished components KB17. problems that can occur with the turning activities, and how these can be overcome KB18. correct procedure to use for checking quality parameters (eg. devices and equipment, use, range, etc.) KB19. extent of their own authority and to whom they should report if they have problems that they cannot resolve. KB20. specific safe working practices and environmental regulations that must be observed KB21. importance of reporting problems in a timely manner
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Communication** The user/ individual on the job needs to know and understand how to:

CSC/ N 0108 : Operating conventional turning machines

	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 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 SA5. liaise with appropriate authorities using correct protocol SA6. communicate with people in respectful form and manner in line with organizational protocol SA7. record progress report accurately and clearly
	Numerical and computational skills
	The user/individual on the job needs to know and understand how to: SA8. undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages) SA9. use appropriate measuring techniques SA10. apply appropriate degree of accuracy to express numbers SA11. calculate tolerance in terms of limits of size SA12. calculate areas of basic & compound shapes SA13. calculate the surface areas of regular shaped solids SA14. calculate the volumes of regular shaped solids SA15. calculate the value of angles in a triangle SA16. apply Pythagoras' Theorem to right-angled triangle problems SA17. interpret straight line graphs using given data
	Learning
	The user/individual on the job needs to know and understand how to: SA18. participate in on-the-job and other learning, training and development interventions and assessments SA19. clarify task related information with appropriate personnel or technical adviser SA20. seek to improve and modify own work practices SA21. maintain current knowledge of application standards, legislation, codes of practice and product/process developments
B. Professional Skills	**Problem Solving**
	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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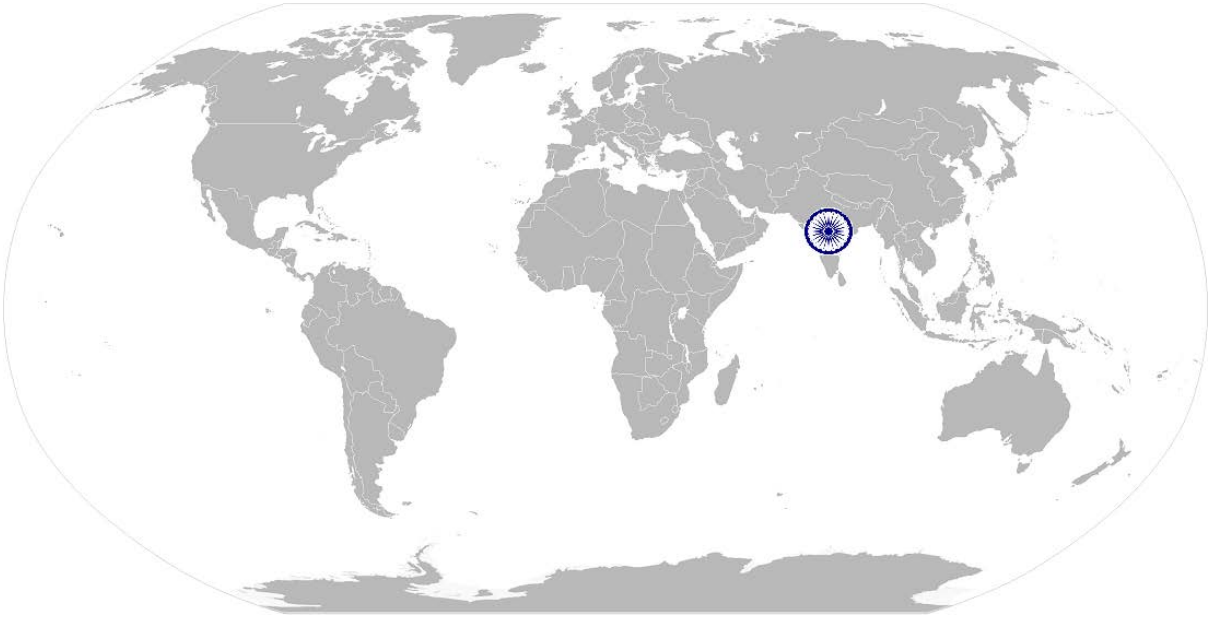
	The user/individual on the job needs to know and understand: SB9. plan, prioritize and sequence work operations as per job requirements SB10. organize and analyze information relevant to work SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Initiative
	The user/individual on the job needs to know and understand how to: SB12. importance and impact of initiative and enterprise for achieving better results for self, others and organization SB13. how to undertake and express new ideas and initiatives to others SB14. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB15. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB16. one's competencies can and should be applied in new and different situations and contexts to achieve more
	Self-Management
	The user/individual on the job needs to know and understand how to: SB17. importance of taking responsibility for own work outcomes SB18. importance of adherence to work timings, dress code and other organizational policies SB19. importance of following laid down rules, procedures, instructions and policies SB20. importance of exercising restraint while expressing dissent and during conflict situations SB21. how to avoid and manage distractions to be disciplined at work SB22. importance of time management for achieving better results
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB23. use drawings to decide tool & equipment to be used to complete the task
	Teamwork
	The user/individual on the job needs to know and understand how to: SB24. work in a team in order to achieve better results SB25. identify and clarify work roles within a team SB26. communicate and cooperate with others in the team SB27. seek assistance from fellow team members experience, reasoning, or communication, as a guide to thought and action

CSC/ N 0108 : Operating conventional turning machines

NOS Version Control

NOS Code	**CSC/ N 0108**		
Credits(NVEQF/NVQF/NSQF) [*OPTIONAL*]	**TBD**	**Version number**	**1.0**
Industry	**Capital Markets**	**Drafted on**	**14/03/14**
Industry Sub-sector	1. Machine Tools 2. Tools Dies And Press Tools 3. Plastic Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering	**Last reviewed on**	
		Next review date	**24/03/14**

National Occupational Standard



Overview

This unit covers grinding of various components required in the manufacturing sector using conventional grinding machines.

CSC/ N 0109 Operate Grinding Machines

National Occupational Standard

Unit Code	CSC/ N 0109
Unit Title (Task)	Operate Grinding Machines
Description	This unit covers grinding of various components required in the manufacturing sector using conventional grinding machines. This will involve carrying out the grinding operations, in accordance with approved procedures, using different grinding machines (eg. horizontal or vertical surface, cylindrical or universal grinding machines). The candidate will be expected to work as per instructions given, taking personal responsibility for own actions and for the quality and accuracy of the work that they produce. The candidate will have an understanding of operating the grinding machine in line with safe working practices and approved procedures and required to mount, position and set the work piece, use grinding feeds, speeds and techniques appropriate to the type of material, type of grinding wheel and operations performed, in order to ensure that the work output is to the required quality and accuracy. The candidate will be expected to grind components that combine a number of different features. The candidate will be expected to check the quality of output, using measuring equipment appropriate to the aspects being checked and the tolerances to be achieved. The candidate will be able to recognize grinding defects and take appropriate action to put right any faults that occur and ensure that the finished work piece is within the drawing requirements. The candidate will understand the safety precautions required when working with the machine, its associated tools and equipment. The candidate will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace

CSC/ N 0109 Operate Grinding Machines

Scope	This unit/task covers the following: Material used for making grinding components are: • low carbon/mild steel • cast iron • plastic/nylon/composite • high carbon steel • brass/brass alloys • aluminum/aluminum alloys • other specific material Various workholding devices for mounting work piece are: • magnetic chuck or blocks • angle plates • chucks • fixed vice • vee block and clamps • centres • swivel or universal vice • fixtures • mandrels Prepare grinding wheels through: • dressing and `trueing up' grinding wheels • wheel forming (such as chamfers, radii, angular forms, profiles) • relieving the wheel sides Grind components which have following features: • faces (flat, parallel, vertical, angular) • steps and shoulders • bores (counter-bores, tapered, parallel) • slots • faces square to each other • diameters (parallel, stepped, tapered) • profile forms Carry out checks for accuracy of: • dimensions • parallelism • surface texture Measuring equipment used during the grinding and checking activities are: • external micrometers • surface finish equipment (eg. comparison plates, machines) Quality and accuracy checks to be observed as applicable to the operation are:

	• components to be free from false grinding cuts, wheel marks, burrs and sharp edges • general dimensional tolerance as applicable • flatness and squareness as applicable • surface texture as per requirement Hazards: • revolving/moving parts of machinery • sparks/airborne particles • bursting grinding wheels • insecure components • burrs and sharp edges on components, etc. Problems: • defects caused by glazed wheels • inappropriate feeds/speeds • damage by work-holding devices • and how these can be overcome Safe conditions on completion: • correctly isolated • cleaning the machine • removing and disposing of waste correctly Safe working practices: • ensuring the correct isolation of the machine before mounting the work-holding devices and work-piece; • fitting and adjusting machine guards and dust extraction equipment, • work-piece is secure, • grinding wheels are free from damage • grinding wheels are clear of the work-piece before starting the machine, etc. Personal protective equipment and safety measures: • correctly fitting overalls and safety glasses • long hair is tied back or netted • removing any jewelery or other items that can become entangled in the machinery, etc. • covered shoes

Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working safely	PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work

CSC/ N 0109 Operate Grinding Machines

	PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing fabrication and fitting operations PC3. work following laid down procedures and instructions PC4. ensure work area is clean and safe from hazards PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition
Operating Grinding Machine	PC6. check that all measuring equipment are within calibration date PC7. obtain and prepare the appropriate materials, tools and equipment PC8. mount the work-piece safely and securely, in line with instructions PC9. set and adjust the machine tool speeds and feeds, in line with instructions PC10. use the machine tool controls safely and correctly, in line with operational procedures PC11. check that the finished components meet the standard required PC12. report any difficulties or problems that may arise with the grinding activities, and carry out any agreed actions PC13. shut down the equipment to a safe condition on completion of the grinding activities
Handling of unresolved problems	PC14. refer the problem to a competent internal specialist if it cannot be resolved PC15. obtain help or advice from specialist if the problem is outside his/her area of competence or experience
Process Compliances	PC16. comply with relevant legislation, standards, policies and procedures
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. relevant legislation, standards, policies, and procedures followed in the company KA2. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions KA3. relevant health and safety requirements applicable in the work place KA4. importance of working in clean and safe environment KA5. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities KA6. reporting structure, inter-dependent functions, lines and procedures in the work area KA7. relevant people and their responsibilities within the work area KA8. escalation matrix and procedures for reporting work and employment related issues KA9. documentation and related procedures applicable in the context of employment and work KA10. importance and purpose of documentation in context of employment and work

CSC/ N 0109 Operate Grinding Machines

B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. safety mechanisms on the machine, and the procedure for checking that they function correctly KB2. correct operation of the machine controls in both hand and power modes; how to stop the machine in both normal and emergency situations, and the procedure for restarting after an emergency KB3. importance of keeping the work area clean and tidy (such as cleaning the machine, disposal of waste, ensuring any spilt cutting fluids are correctly dealt with) KB4. how to use and extract information from engineering drawings and related specifications (to include ISO standard symbols and abbreviations, imperial and metric systems of measurement, work-piece reference points and system of tolerance) KB5. how to mount the work-piece in the work-holding devices KB6. effects of clamping the work-piece in a chuck/work holding device, and how this can cause damage or distortion in the finished components KB7. how to check that the grinding wheels are in a safe and serviceable condition (eg. free from damage, cracks, correctly balanced) KB8. need for `trueing up' and dressing of wheels to prevent glazing and burning of the work-piece, and methods of forming the wheels to the required profile (such as use of pantograph, diamond dressing units) KB9. effects of backlash in machine slides and screws, and how this can be overcome KB10. techniques of taking trial cuts and checking dimensional accuracy KB11. application of roughing and finishing cuts, and the effect on tool life, surface finish and dimensional accuracy KB12. types of grinding wheels, cutting feeds and speeds to be used, and the depth of cut that can be taken KB13. application of cutting fluids with regard to a range of different materials, and why some materials do not require cutting fluids to be used KB14. how to recognize grinding faults, and how to identify when grinding wheels need dressing KB15. checks to be carried out on the components before removing them from the machine (eg. have all operations been completed, dimensional checks, surface finish checks) KB16. problems that can occur with the grinding activities and how to address them KB17. importance of leaving the machine in a safe condition on completion of activities KB18. safe working practices and procedures to be followed when preparing and using grinding machines KB19. hazards associated with the grinding operations and how they can be minimized KB20. personal protective equipment (PPE) to be worn for the grinding activities and personal safety measures taken
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Communication** The user/ individual on the job needs to know and understand how to:

CSC/ N 0109 Operate Grinding Machines

	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 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 SA5. liaise with appropriate authorities using correct protocol SA6. communicate with people in respectful form and manner in line with organizational protocol SA7. record progress report
	Numerical and computational skills
	The user/individual on the job needs to know and understand how to: SA8. undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages) SA9. use appropriate measuring techniques SA10. apply appropriate degree of accuracy to express numbers SA11. calculate tolerance in terms of limits of size SA12. calculate areas of basic & compound shapes SA13. calculate the surface areas of regular shaped solids SA14. calculate the volumes of regular shaped solids SA15. calculate the value of angles in a triangle SA16. apply Pythagoras' Theorem to right-angled triangle problems SA17. interpret straight line graphs using given data
	Learning
	The user/individual on the job needs to know and understand how to: SA18. participate in on-the-job and other learning, training and development interventions and assessments SA19. clarify task related information with appropriate personnel or technical adviser SA20. seek to improve and modify own work practices SA21. maintain current knowledge of application standards, legislation, codes of practice and product/process developments
B. Professional Skills	**Problem Solving**
	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

CSC/ N 0109 Operate Grinding Machines

	The user/individual on the job needs to know and understand: 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
	Initiative
	The user/individual on the job needs to know and understand how to: SB12. importance and impact of initiative and enterprise for achieving better results for self, others and organization SB13. how to undertake and express new ideas and initiatives to others SB14. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB15. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB16. one's competencies can and should be applied in new and different situations and contexts to achieve more
	Self-Management
	The user/individual on the job needs to know and understand how to: SB17. importance of taking responsibility for own work outcomes SB18. importance of adherence to work timings, dress code and other organizational policies SB19. importance of following laid down rules, procedures, instructions and policies SB20. importance of exercising restraint while expressing dissent and during conflict situations SB21. how to avoid and manage distractions to be disciplined at work SB22. importance of time management for achieving better results
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB23. use drawings to decide tool & equipment to be used to complete the task
	Teamwork
	The user/individual on the job needs to know and understand how to: SB24. work in a team in order to achieve better results SB25. identify and clarify work roles within a team SB26. communicate and cooperate with others in the team SB27. seek assistance from fellow team members experience, reasoning, or communication, as a guide to thought and action

NOS Version Control

NOS Code	CSC/ N 0109		
Credits(NVEQF/NVQF/NSQF) [*OPTIONAL*]	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	14/03/14
Industry Sub-sector	1. Machine Tools 2. Tools Dies And Press Tools 3. Plastic Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering	Last reviewed on	
		Next review date	24/03/14

CSC/ N 0159 Perform assembly operations on metal components to make tools and dies

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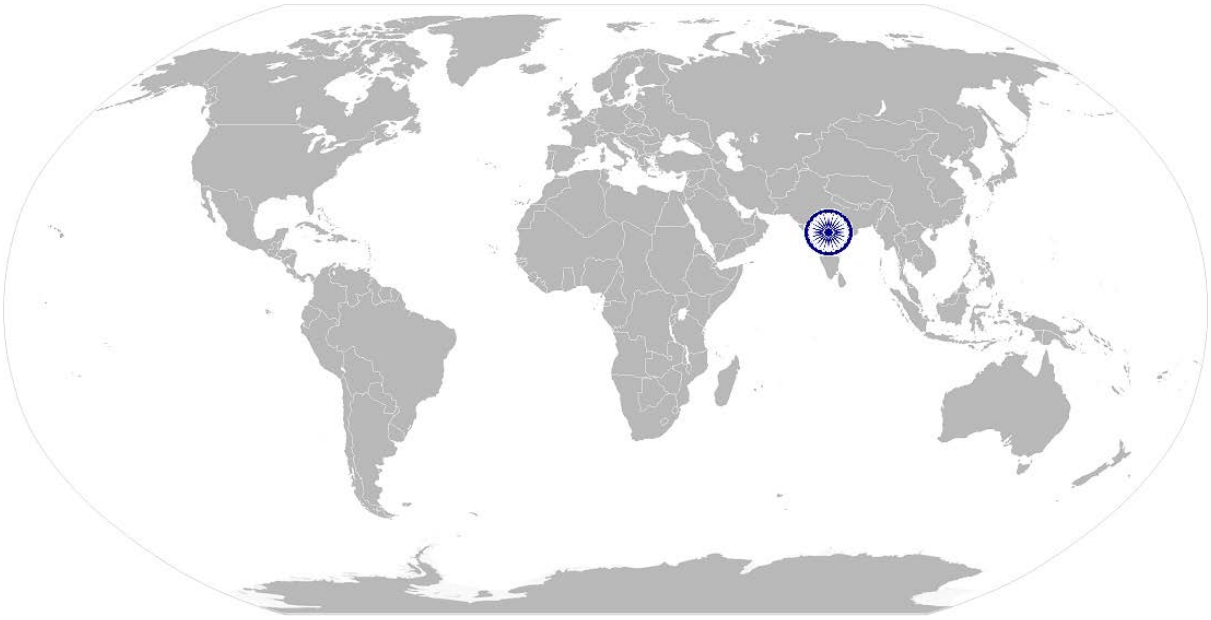
National Occupational Standard



Overview

This unit covers the assembly activities of machinery to make metal tools and dies as per given specifications.

CSC/ N 0159 Perform assembly operations on metal components to make tools and dies

National Occupational Standard

Unit Code	**CSC/ N 0115**
Unit Title (Task)	**Perform assembly operations on metal components to make tools and dies**
Description	This unit covers the fitting and assembly activities to make tools and dies of features as per given specifications. The candidate will be expected to On completion of the fitting and fabrication operations on the metal components, the candidate will be expected to check the quality of the workpieces, using measuring equipment appropriate to the aspects being checked and the tolerances to be achieved; performs the final assembly, and tests the tools. On completion of the activities, the candidate will be expected to return all tools and equipment that they have used to the correct location, and to leave the work area in a safe and tidy condition. The candidate's responsibilities will require them to comply with health and safety requirements and organizational policy and procedures for the activities undertaken. The candidate will work under a high level of supervision, whilst taking responsibility for their own actions and for the quality and accuracy of the work that they carry out. The candidate's knowledge will provide an understanding of their work, and will enable them to apply appropriate machining, fitting and assembly techniques and procedures safely. The candidate will understand the machining, fitting and assembly processes, their application. The candidate will know about the equipment, materials and consumables, to the required depth to provide a sound basis for carrying out the activities to the required specification. The candidate will understand the safety precautions required when carrying out the various machining, fitting and assembly techniques, and when using hand tools and machinery. The candidate will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.
Scope	This unit/task covers the following: Range of Materials: • Ferrous metals: eg. carbon steels, stainless steels, cast iron, tool steel, hard metals • Non-ferrous metals: eg. bronze, bronze alloys, copper and copper alloys • Non-metallic: eg. hard and soft woods, composites, plastics: thermoplastic, thermosetting Properties • plasticity • elasticity • ductility • malleability • toughness • hardness • tensile strength • compressive strength • shear strength

- corrosion resistance
- density

Valid sources for job specifications are:

- job instruction sheet/job card
- work drawings and instructions
- planning documentation
- quality control documents
- operation sheets
- process specifications
- instructions from supervisor

Job specification documents are:

- detailed component drawings
- approved sketches/illustrations
- national, international and organisational standards
- reference tables and charts
- fabrication/casting drawings
- operational diagrams
- contractual specifications

Job requirements to be established are:

- 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 fabricated
- cutting, bending and rolling allowances for fabricated forms
- instruments and tools to be used
- interdependencies
- timelines

Heavy equipment:

- rollers and skates
- crowbars
- pull-lifts
- lubricated plates

Accessories for assembling:

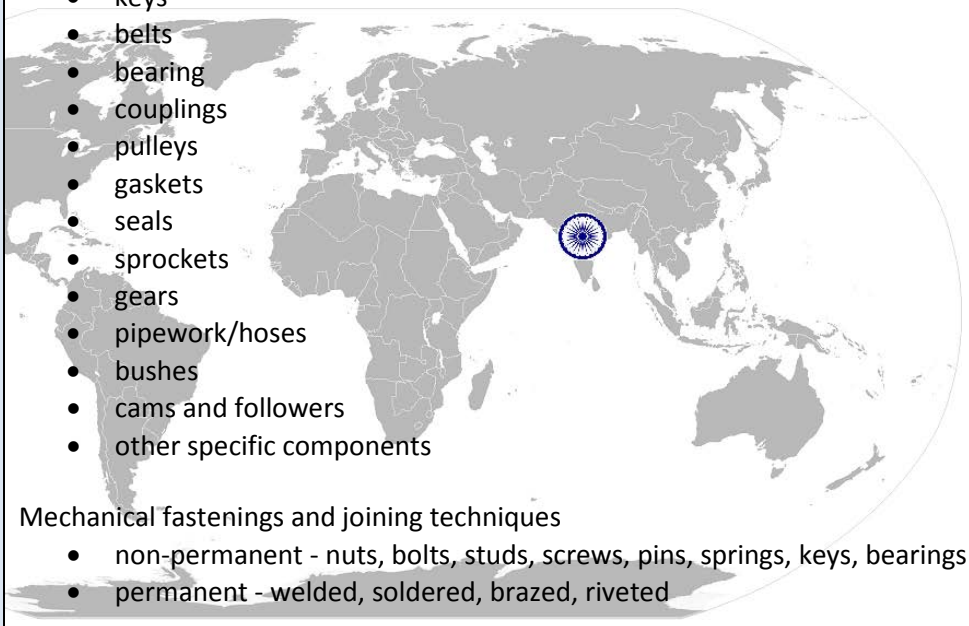
- hooks
- slings
- eyebolts
- shackles

CSC/ N 0159 Perform assembly operations on metal components to make tools and dies

- chains
- rings
- special-to-purpose equipment
- rules for the use of slings
- trolleys

Parts used for producing assemblies:

- assembly structure (framework, support, casings, panels)
- pre-machined components
- shafts
- levers/linkages
- springs
- fabricated components
- chains
- keys
- belts
- bearing
- couplings
- pulleys
- gaskets
- seals
- sprockets
- gears
- pipework/hoses
- bushes
- cams and followers
- other specific components



Mechanical fastenings and joining techniques

- non-permanent - nuts, bolts, studs, screws, pins, springs, keys, bearings
- permanent - welded, soldered, brazed, riveted

Workholding devices:

- bench / machine vice
- clamps (eg. toolmaker's)
- three-jaw chuck
- four-jaw chuck
- collet chuck
- drive plate and centres
- magnetic chucks(holding devices)
- special purpose tool holders (3R for holding electrodes)

Hand fitting methods

- cutting out the rough profile using saws (eg. hacksaw, band saw)
- cutting a screw thread (eg. tapping or dieing)
- filing (flat, square, curved)

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	• drilling holes • tapping Methods to produce mechanical assemblies • assembling components having interference fits (eg. by pressure, expansion or contraction) • securing components using threaded fasteners (eg. nuts, bolts, machine screws, cap screws) • securing components using spring clips (eg. external circlips, internal circlips, special clips) • using locking and retaining devices (eg. tab washers, locking nuts, wire locks, special purpose types) • securing components using rivets (eg. countersunk, roundhead, blind, special purpose types) • applying sealing compounds or adhesives • electrical bonding of components • setting and adjusting components to give correct working parameters (eg. shimming and packing) • torque setting of nuts and bolts Dimensional parameters are: • linear dimensions (eg. lengths, depths) • diameters (eg. external, internal) • flatness • squareness • angles • profiles • hole size and position • thread size and fit • surface finish Measuring equipments • external micrometers • vernier/digital/dial caliper • surface finish equipment (eg. comparison plates, machines) • rules • squares • protractors • depth micrometers • depth verniers • feeler gauges • bore/hole gauges • slip gauges • radius/profile gauges • thread gauges • height gauge

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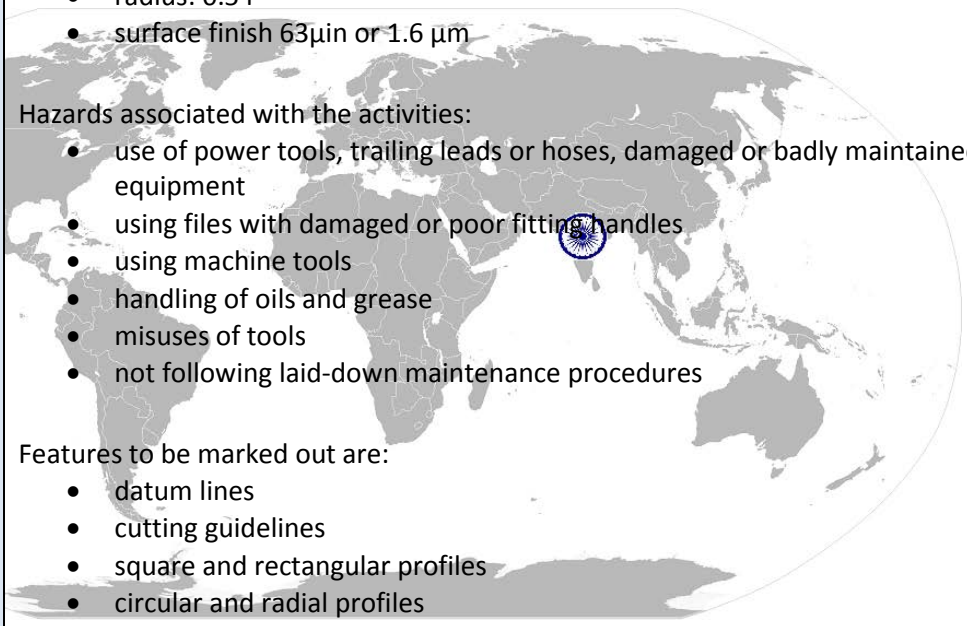
- hardness tester
- dial test indicators (DTI)
- surface roughness tester
- coordinate measuring machine (CMM)
- profile projectors

Components quality standards as per the process:

- components to be free from false tool cuts, burrs and sharp edges
- dimensional tolerance +/-0.020mm
- flatness and squareness 0.05mm
- angles within +/- 1 degree
- screw threads to fit as per standard
- reamed and bored holes within interference: - 0.025mm (hole) + 0.025mm (shaft), transition: - 0.1mm (hole) + 0.1 (shaft) , clearance: 50microns
- radius: 0.5 r
- surface finish 63µin or 1.6 µm



Hazards associated with the activities:

- use of power tools, trailing leads or hoses, damaged or badly maintained tools and equipment
- using files with damaged or poor fitting handles
- using machine tools
- handling of oils and grease
- misuses of tools
- not following laid-down maintenance procedures

Features to be marked out are:

- datum lines
- cutting guidelines
- square and rectangular profiles
- circular and radial profiles
- angles
- holes linearly positioned, boxed and on pitch circles

The various fitting activities to be carried out

- file flat, square and curved surfaces and achieve a smooth surface finish
- select saw blades for different materials, and how to set the saw blades for different operations
- produce screw threads on workpieces using hand dies
- determine the drill size for tapped holes, and the importance of using the taps in the correct sequence

Tools for workholding:

- in a bench vice
- machine vice

- chuck
- collets or clamped directly to the machine table

Mount and secure the cutting tools in the tool holding devices:

- front or rear tools posts
- mounting cutters on long or stub arbors
- mounting drills in chucks or by the use of morse taper sockets
- the need to ensure that the tool is sharp and secure

The factors that affect the selection of cutting feeds and speeds, and the depth of cut that can be taken:

- type of material
- size of material
- operations being performed
- workholding method/security of workpiece
- condition of machine
- finish required
- tolerance required

Lubricants:

- friction between moving parts, wear, generation of heat, force required to overcome friction
- methods of reduction (oils (mineral, synthetic, animal and vegetable) greases, copper compound, graphite)
- application (total loss, re-circulatory, splash, grease guns and nipples)
- reasons for oil deterioration (excessive heat, oxidation, contamination, breakdown of structure, poor storage conditions)

Methods to dismantle:

- procedure for isolation and locking off a device/system
- sequence of operations used to dismantle a device/system
- proof marking, correct storage procedures for removed parts
- release of pressure/force
- extraction

Machine tools

- lathes (centre, turret)
- milling machines (horizontal, vertical, universal)
- drilling machines (bench, pedestal, radial arm, multi-spindle, co-ordinate table, special purpose)
- grinding machines [surface (horizontal spindle, vertical spindle), cylindrical (plain, universal), internal, special purpose]
- electrochemical machining (ECM)
- laser machining
- welding machine
- polishing machine

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	Alignment • slideways: flat, vee, dovetail, cylindrical, comparison of their capabilities, main features, accuracy of movement, means of adjustment, lubrication, protection • stick-slip: definition, recirculating ball leadscrews, hydrostatic slides • typical checks: coaxial alignment between main spindle axis, coaxial alignment between two spindles, alignment of spindle to guideway, squareness of slideways movement, concentricity and end float of spindle, squareness of planes to spindle, setting of guards, stops and automatic safety cut-outs • bearings: plain bush (radial, radial and axial) ball (radial, axial, radial and axial) roller (radial, axial, radial and axial) • methods of alignment: standard tests, straight edge, precision level, autocollimator and reflector, roundness measuring machine Engineering principles: • Degree of accuracy: correct to three significant figures, correct to three decimal places, express a decimal fraction in standard form, express tolerance in terms of limits of size • Algebraic expressions: represent numerical quantities using symbols, apply laws of precedence in the use of precedence (BODMAS) • Straight line graphs: determining suitable scales from given data, defining and correctly labeling axes, determine the gradient, determine the intercept, prove the law of the straight line graph is y = mx + c • Sine, Cosine and Tangent: state their ratios for angles up to 90°, determine their values for given angles up to 90°, solve simple problems • Moments of a force: define and apply the 'Principle of Moments', define the meanings of the terms 'torque' & 'couple' • Solve problems: associated with levers and couples work, power and energy define work done in terms of force and distance moved

Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working safely	PC1. work safely at all times, complying with health and safety, environmental and other relevant regulations and guidelines PC2. check that all safety mechanisms are in place and that the equipment is set correctly for the required operations PC3. adhere to procedures or systems in place for health and safety, including personal protective equipment and other relevant safety regulations and procedures to contribute to a safe work environment PC4. wear the appropriate protective clothing and equipment, and keep the work area clean and tidy PC5. follow safe practice/approved setting up procedures at all times

CSC/ N 0159 Perform assembly operations on metal components to make tools and dies

Checking dimensions of the components of tool or die	PC6. select measuring instruments based on tolerances required and application PC7. such as internal and external measurements PC8. take measurements using standard and specialized measuring instruments PC9. compare measurements to drawings and sketches to ensure conformity, fits and clearnaces PC10. record critical dimensions as required by workplace procedures
Preparing for assembling operations	PC11. determine job requirement using appropriate sources PC12. establish the procedures to complete the general machining, fitting or assembling operations PC13. obtain the appropriate tools and equipment for the general machining, fitting or assembling operation PC14. check that all measuring equipment is within calibration date PC15. fasten or clamp production tool components temporarily as required for final assembly
Perform assembling operations	PC1. drill, tap and ream locating holes as required to permanently locate components PC2. fasten components permanently using methods such as using engineered fasteners, applying adhesives, soldering and brazing PC3. appropriate methods and techniques to assemble and secure the components in their correct positions PC4. produce mechanical assemblies as per job specifications PC5. dismantle mechanical assemblies without damage to components and/or subassemblies PC6. deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve PC7. leave the work area in a safe and tidy condition on completion of the manufacturing activities PC8. return all tools and equipment to the correct location on completion of the fitting activities support the customer remotely over the internet to test potential solutions
Measuring and checking component	PC9. perform the necessary checks for dimensional accuracy and functioning of the tool and die PC10. use the appropriate measuring equipment for checking activities PC11. produce components within all of the applying standards
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

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	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. how to extract and use information from engineering drawings and related specifications in relation to work undertaken KB2. how to interpret first and third angle drawings KB3. SI, FPS and metric systems of measurement KB4. Geometric Dimensioning and Tolerancing -- GD&T KB5. methods of holding the workpiece assembly activities KB6. how to mount workpiece KB7. assembly methods, techniques and procedures to be used KB8. how the components are to be aligned, adjusted and positioned prior to securing them, and the tools and equipment KB9. various mechanical fastening devices that are used KB10. how to mount and secure the cutting tools in the tool holding devices KB11. types of production tools such as jigs, fixtures, dies, cutting tools and moulds KB12. specifications for standard assembly fits and clearances KB13. types of fasteners such as screws and dowels KB14. types of adhesives such as temporary and permanent KB15. types of solder such as hard and soft KB16. types of fits such as interference and running clearance KB17. types of joints such as lap and dovetail KB18. types of dies such as cutting, forming, progressive and compound KB19. types of workholding devices such as drill jig, weld jig and assembly fixture KB20. clearance-setting practices such as inserting material between working faces and using light source KB21. material properties such as composition and thickness KB22. types of compression aids such as springs, compressed gas cylinders and urethane KB23. types of non-compression devices such as punch retainers, pilots, punches and buttons KB24. pre-loads on die springs, compressed gas cylinders and urethane strippers KB25. optimal sequence of operations for assembly KB26. techniques of taking trial cuts and checking dimensional accuracy; the application of roughing and finishing cuts, and the effect on tool life, surface finish and dimensional accuracy KB27. how to check the workpiece and the measuring equipment that is used KB28. need to check that the measuring equipment is within current calibration dates, and that the instruments are correctly zeroed KB29. measuring internal and external dimensions KB30. measuring geometric features KB31. how to check surface finish KB32. the importance of leaving the work area and equipment in a safe and clean condition on completion of the machining and fitting activities
Skills (S) [Optional]	
	Communication

CSC/ N 0159 Perform assembly operations on metal components to make tools and dies

A. Core Skills/ Generic Skills	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 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 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 SA8. identify and draw various basic, compound and solid shapes as per dimensions given SA9. use appropriate measuring techniques and units of measurement SA10. use appropriate units and number systems to express degree of accuracy SA11. interpret and express tolerance in terms of limits on dimensions SA12. calculation of the value of angles in a triangle
	Learning
	The user/individual on the job needs to know and understand how to: SA13. maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments SA14. participate in on-the-job and other learning, training and development interventions and assessment SA15. clarify task related information with appropriate personnel or technical adviser SA16. seek to improve and modify own work practices
B. Professional Skills	**Problem solving**
	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
	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

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	SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Initiative and Enterprise
	The user/individual on the job needs to know and understand: SB12. importance and impact of initiative and enterprise for achieving better results for self, others and organization SB13. how to undertake and express new ideas and initiatives to others SB14. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB15. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB16. one's competencies can and should be applied in new and different situations and contexts to achieve more
	Self-Management
	The user/individual on the job needs to know and understand: SB17. importance of taking responsibility for own work outcomes SB18. importance of adherence to work timings, dress code and other organizational policies SB19. importance of following laid down rules, procedures, instructions and policies SB20. importance of exercising restraint while expressing dissent and during conflict situations SB21. how to avoid and manage distractions to be disciplined at work SB22. importance of time management for achieving better results
	Teamwork
	The user/individual on the job needs to know and understand how to: SB23. work in a team in order to achieve better results SB24. identify and clarify work roles within a team SB25. communicate and cooperate with others in the team SB26. seek assistance from fellow team members

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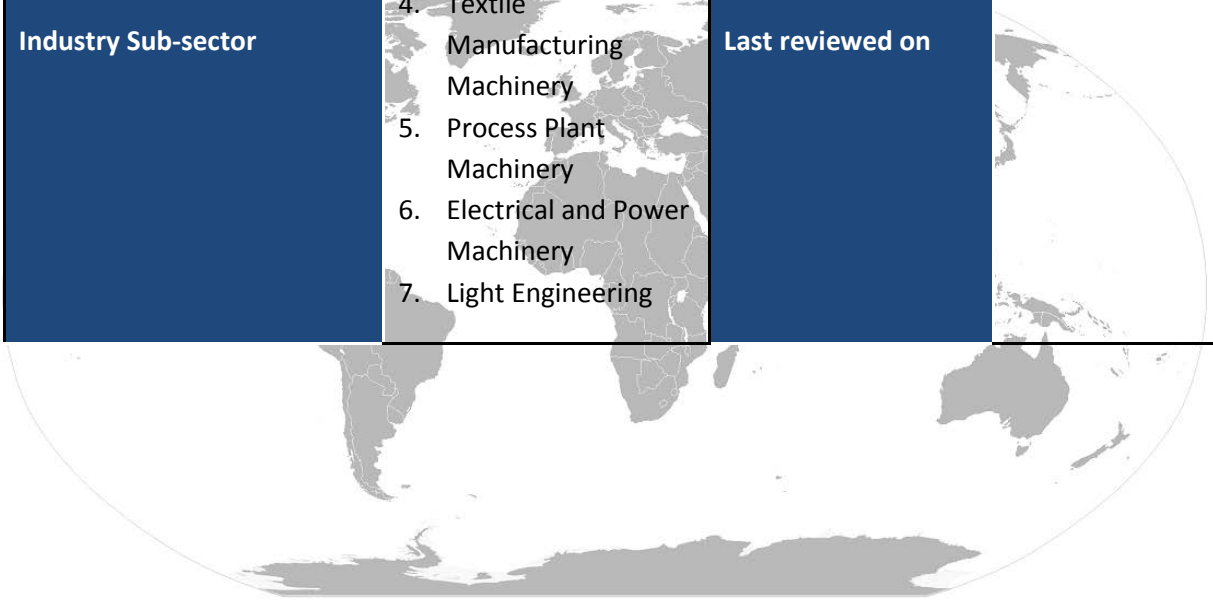
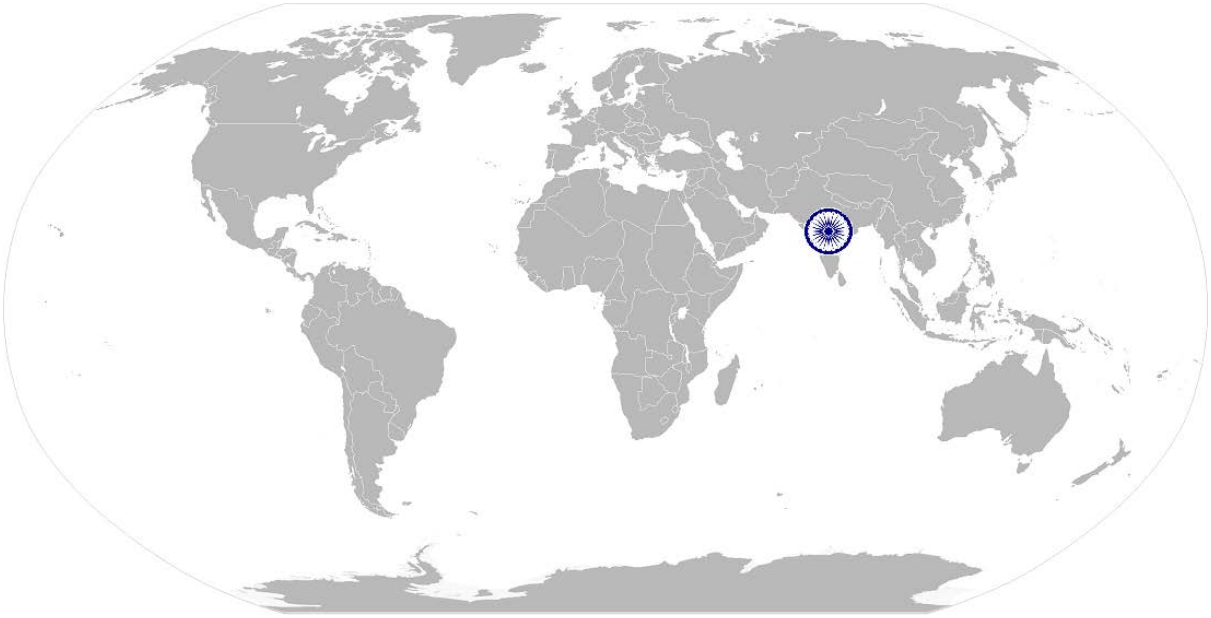
NOS Version Control

NOS Code	CSC/ N 0159		
Credits(NSQF)[*OPTIONAL*]	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	24/03/14
Industry Sub-sector	1. Machine Tools 2. Tools Dies And Press Tools 3. Plastic Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering	Last reviewed on	



CSC/ N 0135 **Use basic health and safety practices at the workplace**

National Occupational Standard



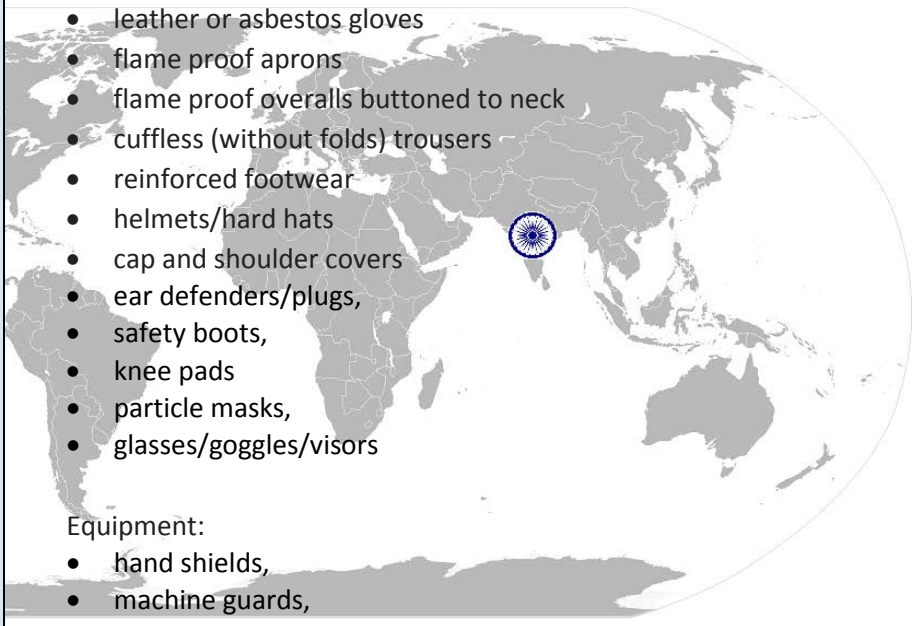
Overview

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 0135 **Use basic health and safety practices at the workplace**

National Occupational Standard

Unit Code	**CSC / N 0135**
Unit Title (Task)	**Use basic health and safety practices at the workplace**
Description	This OS unit is about knowledge and practices relating to health and safety that candidates need to use in the workplace. It covers select responsibilities towards self, others, assets and the environment. It includes understanding of risks and hazards in the workplace, alongwith 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: 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 Hazards: • working with electrical and thermal tools and equipment • sharp edged and heavy tools, • heated metals • oxyfuel and gas cylinders • welding radiation • surfaces: sharp, slippery, uneven, chipped, broken, etc. • substances: chemicals, gas, oxy-fuel, fumes, dust, etc. • physical: 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: power supply and points, loose and naked cables and wires, electrical machines and appliances, etc.

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.

Methods:
- 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

Ladders:
Faults :
- corrosion of metal components
- deterioration
- splits and cracks timber components
- imbalance
- loose rungs
- nuts or bolts, etc.

Set up:
- firm/level base
- clip/lash down
- leaning at the correct angle, etc.

Good housekeeping practices:
- clean/tidy work areas
- removal/disposal of waste products

- protect surfaces

Emergency procedures:

- raising alarm
- safe/efficient evacuation
- correct means of escape
- correct assembly point
- roll call
- correct return to work

Various areas:

- on chemical containers
- equipment
- packages
- inside buildings
- open areas and public spaces, etc.

General health and safety equipment:

- fire extinguishers,
- first aid equipment,
- safety instruments and clothing,
- safety installations, eg. fire exits, exhaust fans

Incident Report:

- 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

Job titles:

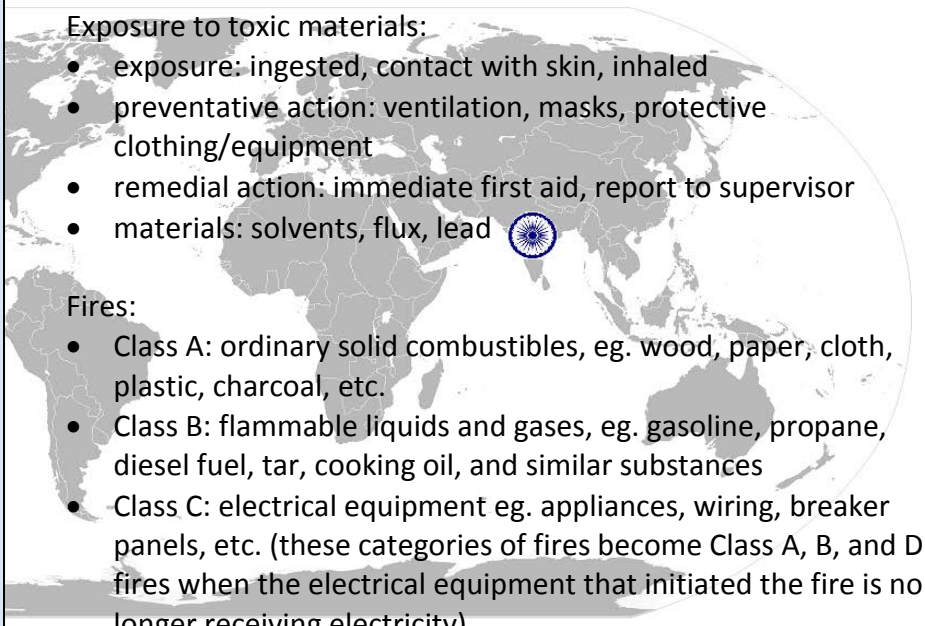
- health and safety officer
- first aid officer
- fire officer

Documents:

- fire notices
- accident reports
- safety instructions for equipment and procedures
- company notices and documents
- legal documents (eg. government notices)

Activities and causes:

- physical actions,
- reading,
- listening to and giving instructions,
- inattention,
- sickness and incapacity (eg. drunkenness),
- health hazards (eg. untreated injuries and contagious illness)



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
- materials: solvents, flux, lead

Fires:

- Class A: ordinary solid combustibles, eg. wood, paper, cloth, plastic, charcoal, etc.
- Class B: flammable liquids and gases, eg. gasoline, propane, diesel fuel, tar, cooking oil, and similar substances
- Class C: electrical equipment eg. 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)

Causes of fires:

- heating of metal,
- spontaneous ignition,
- sparking,
- electrical heating,
- loose fires (eg. smoking, welding, etc.),
- chemical fires, etc.

Fire extinguishers:

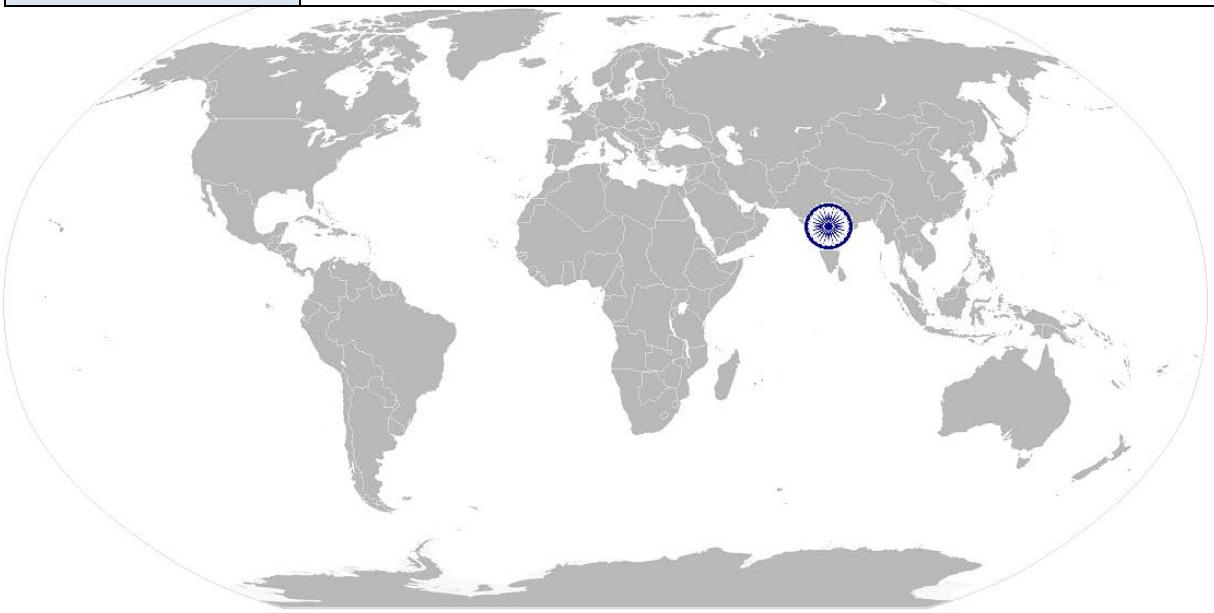
	• sand, • water • foam • CO_2 • dry powder
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Health and safety	PC1. use protective clothing/equipment for specific tasks and work conditions PC2. state the name and location of people responsible for health and safety in the workplace. 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. 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 PC6. state location of general health and safety equipment in the workplace PC7. inspect for faults, set up and safely use steps and ladders in general use PC8. work safely in and around a trench PC9. lift heavy objects safely using correct procedures PC10. apply good housekeeping practices at all times PC11. identify common hazard signs displayed in various areas PC12. retrieve and/or point out documents that refer to health and safety in the workplace.
Fire safety	PC13. use the various appropriate fire extinguishers on different types of fires correctly PC14. demonstrate rescue techniques applied during fire hazard PC15. demonstrate good housekeeping in order to prevent fire hazards PC16. demonstrate the correct use of a fire extinguisher.
Emergencies, rescue and first-aid procedures	PC17. demonstrate how to free a person from electrocution PC18. administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc. PC19. demonstrate basic techniques of bandaging PC20. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments

	PC21. perform and organize loss minimization or rescue activity during an accident in real or simulated environments 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 PC23. demonstrate the artificial respiration and the CPR Process PC24. participate in emergency procedures. PC25. complete a written accident/incident report or dictate a report to another person, and send report to person responsible PC26. demonstrate correct method to move injured people and others during an emergency
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. names (and job titles if applicable), and describe 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. activities and causes of risk and accident KB5. methods of accident prevention 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. KB11. importance of using protective clothing/equipment while working KB12. precautionary activities to prevent the fire accident KB13. various causes of fire KB14. techniques of using the different fire extinguishers KB15. different methods of extinguishing fire KB16. rescue techniques applied during a fire hazard KB17. various types of safety signs and what they mean KB18. appropriate basic first aid treatment relevant to the condition eg. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries

	KB19. content of written accident report. KB20. potential injuries and ill health associated with incorrect manual handing KB21. safe lifting and carrying practices KB22. personal safety, health and dignity issues relating to the movement of a person by others. KB23. 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: 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 0135 **Use basic health and safety practices at the workplace**

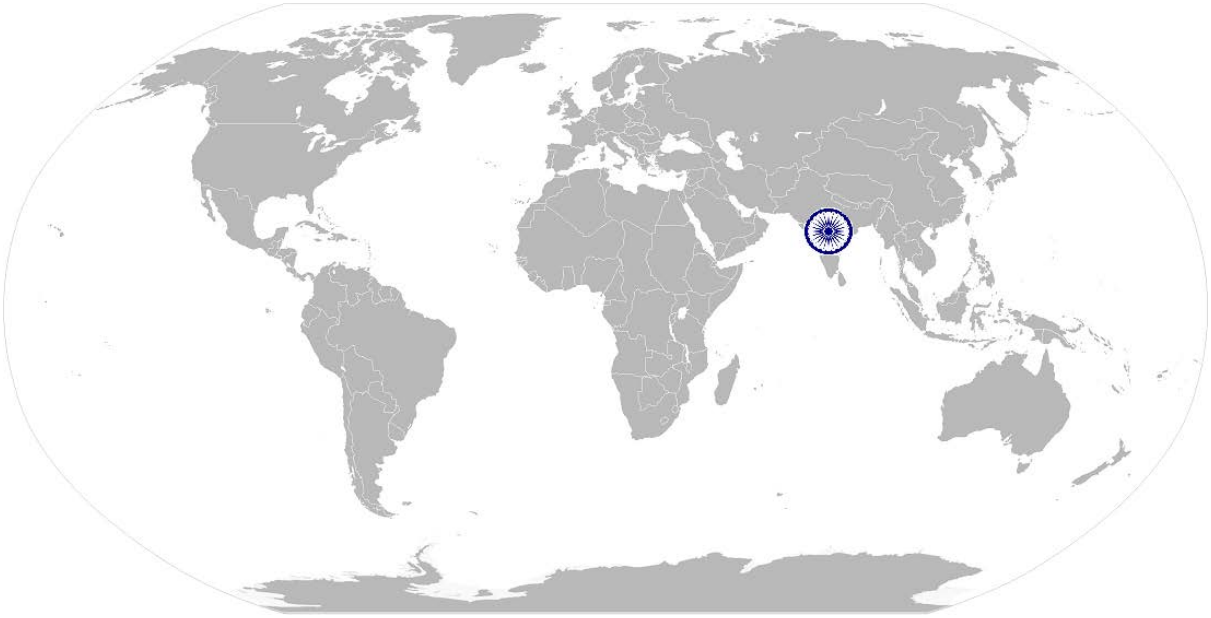
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB7. think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) SB8. identify immediate or temporary solutions to resolve delays SB9. identify sources of support that 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



NOS Version Control

NOS Code	**CSC / N 0135**		
Credits(NVEQF/NVQF/NSQF) [*OPTIONAL*]	**TBD**	**Version number**	**1.0**
Industry	**Capital Goods**	**Drafted on**	**14/03/2014**
Industry Sub-sector	1. Machine Tools 2. Tools Dies And Press Tools 3. Plastic Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery **6.** Electrical and Power Machinery **7.** Light Engineering	**Last reviewed on**	
		Next review date	**24/03/2014**

National Occupational Standard



Overview

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

CSC/ N 0136 Work effectively with others

National Occupational Standard

Unit Code	CSC / N 0136
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: Etiquette: • do not use abusive language • use appropriate titles and terms of respect • do not eat or chew while talking (vice versa)etc. Behaviors: • punctuality • completing tasks as per given time and standards • not gossiping and idling time • eliminating waste • honesty, etc.

Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working Safely	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 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

	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
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

NOS Version Control

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Credits(NVEQF/NVQF/NSQF) [*OPTIONAL*]	**TBD**	**Version number**	**1.0**
Industry	**Capital Goods**	**Drafted on**	**14/03/14**
Industry Sub-sector	1. Machine Tools 2. Tools Dies And Press Tools 3. Plastic Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery **6.** Electrical and Power Machinery **7.** Light Engineering	**Last reviewed on**	
		Next review date	**24/03/14**