

Qualification Pack



Tool and Die Maker

QP Code: CSC/Q0306

Version: 1.0

NSQF Level: 5

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CSC/Q0306: Tool and Die Maker

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.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [CSC/N0108: Operate conventional milling machines](#)
2. [CSC/N0109: Operate grinding machines](#)
3. [CSC/N0110: Operate conventional turning machines](#)
4. [CSC/N0302: Grind surface using hand and hand-held power tools](#)
5. [CSC/N0307: Plan and co-ordinate the making of tools and die](#)
6. [CSC/N0308: Perform fitting operations on metal components for making tools and dies using hand tools and manually operated machines](#)
7. [CSC/N0309: Perform assembly operations on metal components to make tools and dies](#)
8. [CSC/N1335: Use basic health and safety practices at the workplace](#)
9. [CSC/N1336: Work effectively with others](#)

Qualification Pack (QP) Parameters

Sector	Capital Goods
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Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Fitting and Assembly
Country	India
NSQF Level	5
Aligned to NCO/ISCO/ISIC Code	NCO-2004/7222.20, 7222.50
Minimum Educational Qualification & Experience	10th Class with 1-2 Years of experience Experience in Mechanical Engineering
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	24/11/2017
Next Review Date	31/03/2022
NSQ Approval Date	19/05/2015
Version	1.0
Reference code on NQR	2015/CCM/GCSC/00132
NQR Version	1.0

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CSC/N0108: Operate conventional milling machines

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) on conventional horizontal milling machine and vertical milling machine.

Scope

This unit/task covers the following:

- Work safely
- Prepare for operating conventional milling machine
- Carry out operations on conventional milling machine
- Handle unresolved problems

Elements and Performance Criteria

Work safely

To be competent, the user/individual on the job must be able to:

- PC1.** comply with health and safety, environmental and other relevant regulations and guidelines at work
- PC2.** adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing machining operations (Personal protective equipment: eg. correctly fitting overalls; safety glasses; long hair is tied back or netted; removing any jewellery or other items that can become entangled in the machinery; covered shoes; face mask, etc.)
- PC3.** work following laid down procedures and instructions
- PC4.** ensure the 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

Prepare for operating conventional milling machine

To be competent, the user/individual on the job must be able to:

- 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 (Job specifications: instructions from supervisor/person-in-charge, operational drawings; approved sketches/illustrations (Valid sources: supervisor, job instruction sheet/job card; work drawings and Instructions)
- PC9.** read and establish job requirements from the job specification document (to include symbols and conventions to appropriate ISO standards in relation to work undertaken) (Job specifications documents: instructions from supervisor/person-in-charge, operational drawings; approved sketches/illustrations)
- PC10.** prepare and maintain the work area as per procedure or operation specification

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- PC11.** confirm with the machine setter that the machine is ready for production
- PC12.** seek any necessary instruction/training on the operation of the various milling machines, where appropriate (Milling machines: horizontal milling machine, vertical milling machine)
- 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 to maintain the required accuracy and quality standards (Quality standards: 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 63in or 1.6m; angles within +/- 1 degree)

Carry out operations on conventional milling machine

To be competent, the user/individual on the job must be able to:

- PC18.** operate the machine controls in both hand and power modes
- PC19.** stop the machine in both normal and emergency situations, and use the correct procedure for restarting after an emergency
- PC20.** use British and metric systems of measurement
- PC21.** perform various milling operations to produce various features on metal and non-metal components (Milling operations: e.g. milling of flat surfaces; gang and straddle milling; milling of sunk and recessed surfaces, face milling, side milling, angular milling, slotting, slitting, keyway cutting, face slot cutting, woodruff cutting, dovetail cutting, etc. Features: 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) Metal and non-metals: Different materials: steel/stainless steel, aluminum/aluminum alloys, copper/copper alloys, cast iron, plastic)
- PC22.** produce components as per given quality standards (Components quality standards as per the process: e.g. 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 63in or 1.6m; angles within +/- 1 degree, etc.)
- PC23.** plan and work accordingly to achieve given production targets
- 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 cutting fluids with regard to a range of different materials
- PC27.** clamp the workpiece securely and without distortion in a chuck/work holding device such as vice, V-block, clamp, angle plate, etc.
- PC28.** report any difficulties or problems that may arise with the milling activities, and carry out any agreed actions
- PC29.** shut down the equipment to a safe condition on completion of the milling activities (Safe conditions: correctly isolated; cleaning the machine; removing and disposing of waste correctly)

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- PC30.** use range of equipment to check critical parameters (Range of checking equipment: e.g. tri-square, bevel protractor, vernier caliper, micrometers (internal, external, depth), height gauge, go-no-go gauges, spring caliper, etc.) (Critical parameters: dimensions, squareness, hole size/fit, angles, flatness; surface finish; slots; recesses)
- PC31.** perform the checks to be carried out on the components before removing them from the machine, and on the equipment needed for this activity
- PC32.** ensure that the quality control procedures are used while operating the equipment

Handle unresolved problems

To be competent, the user/individual on the job must be able to:

- PC33.** refer the problem to a competent internal specialist if it cannot be resolved
- PC34.** obtain help or advice from the specialist if the problem is outside his/her area of competence or experience

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
- KU2.** relevant health and safety requirements applicable in the workplace
- KU3.** importance of working in a clean and safe environment
- KU4.** own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU5.** reporting structure, inter-dependent functions, lines and procedures in the work area
- KU6.** relevant people and their responsibilities within the work area
- KU7.** escalation matrix and procedures for reporting work and employment related issues
- KU8.** documentation and related procedures applicable in the context of employment and work
- KU9.** importance and purpose of documentation in the context of employment and work
- KU10.** where personal protective equipment to be worn can be obtained
- KU11.** hazards associated with the milling operations and how they can be minimized
- KU12.** importance of keeping the work area clean and tidy
- KU13.** where to obtain the component drawings, specifications and/or job instructions required for the components to be machined
- KU14.** how to read and interpret first and third angle component drawings
- KU15.** how to extract information from engineering drawings or data and related specifications
- KU16.** how to use imperial and metric systems of measurement
- KU17.** main parts of conventional milling machines and the accessories that can be used (Milling machines: horizontal milling machine, vertical milling machine) (Accessories: e.g. saddle, compound slide, tailstock, profile attachments, fixed and live stays, etc.)
- KU18.** purpose and applications of milling
- KU19.** different types of milling cutters and their uses

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- KU20.** various milling operations that can be performed, and the features produced on metal and non-metal components (Milling operations: e.g. milling of flat services; gang and straddle milling; milling of sunk and recessed surfaces, face milling, side milling, angular milling, slotting, slitting, keyway cutting, face slot cutting, woodruff cutting, dovetail cutting, etc. Features: 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)
- KU21.** processes of milling e.g. up milling, down milling, face milling, end milling, etc.
- KU22.** effects of backlash in machine slides and screws, and how this can be overcome
- KU23.** effects of clamping the workpiece in a chuck/work holding device, and how this can cause distortion in the finished components
- KU24.** production cost, machine hour rate, raw material cost, tool cost, coolant cost, overheads, cycle time, idle time, cost of machine idling, part rejection cost
- KU25.** selection of cutting tools, tool materials, chip breaker geometry, selecting cutting parameters from tool catalogues, selecting coolant
- KU26.** relationship between metal cutting results, tool nose radius, speed and feed rate
- KU27.** how to recognize machining faults and how to identify when tools need resharpening
- KU28.** problems that can occur with the milling activities, and how these can be overcome
- KU29.** extent of their own authority and to whom they should report if they have problems that they cannot resolve
- KU30.** safe working practices and environmental regulations that must be observed
- KU31.** importance of reporting problems in a timely manner

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language
- GS2.** fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
- GS3.** undertake numerical operations, and calculations/ formulae (Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)
- GS4.** identify and draw various basic, compound and solid shapes as per dimensions given (Basic shapes: square, rectangle, triangle, circle) (Compound shapes: involving squares, rectangles, triangles, circles, semicircles, quadrants of a circle) (Solid shapes: cube, rectangular prism, cylinder)
- GS5.** use appropriate measuring techniques and units of measurement
- GS6.** use appropriate units and number systems to express the degree of accuracy (Units and number systems representing the degree of accuracy: decimals places)
- GS7.** work in a team in order to achieve better results
- GS8.** convey and share technical information clearly using appropriate language
- GS9.** check and clarify task-related information
- GS10.** liaise with appropriate authorities using the correct protocol

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- GS11.** communicate with people in a respectful form and manner in line with organizational protocol
- GS12.** plan, prioritize and sequence work operations as per job requirements
- GS13.** organize and analyze information relevant to work
- GS14.** basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS15.** exercise restraint while expressing dissent and during conflict situations
- GS16.** avoid and manage distractions to be disciplined at work
- GS17.** manage own time for achieving better results
- GS18.** work in a team in order to achieve better results
- GS19.** identify and clarify work roles within a team
- GS20.** communicate and cooperate with others in the team for better results
- GS21.** seek assistance from fellow team members
- GS22.** identify problems with work planning, procedures, output and behaviour and their implications
- GS23.** prioritize and plan for problem solving
- GS24.** communicate problems appropriately to others
- GS25.** identify sources of information and support for problem-solving
- GS26.** seek assistance and support from other sources to solve problems
- GS27.** identify effective resolution techniques
- GS28.** select and apply resolution techniques
- GS29.** seek evidence for problem resolution
- GS30.** undertake and express new ideas and initiatives to others
- GS31.** modify the work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS32.** participate in improvement procedures including process, quality and internal/external customer/supplier relationships
- GS33.** enhance ones competencies in new and different situations and contexts to achieve more
- GS34.** participate in on-the-job and other learning, training and development interventions and assessment
- GS35.** clarify task-related information with appropriate personnel or technical adviser
- GS36.** seek to improve and modify own work practices
- GS37.** maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work safely</i>	3	10	-	-
PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work	1	2	-	-
PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing machining operations (Personal protective equipment: eg. correctly fitting overalls; safety glasses; long hair is tied back or netted; removing any jewellery or other items that can become entangled in the machinery; covered shoes; face mask, etc.)	1	2	-	-
PC3. work following laid down procedures and instructions	1	2	-	-
PC4. ensure the work area is clean and safe from hazards	-	2	-	-
PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition	-	2	-	-
<i>Prepare for operating conventional milling machine</i>	4	27	-	-
PC6. check that all measuring equipment is within calibration date	-	2	-	-
PC7. ensure that the components used are free from foreign objects, dirt or other contamination	-	2	-	-
PC8. ensure availability of job specification from a valid source (Job specifications: instructions from supervisor/person-in-charge, operational drawings; approved sketches/illustrations (Valid sources: supervisor, job instruction sheet/job card; work drawings and Instructions)	-	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. read and establish job requirements from the job specification document (to include symbols and conventions to appropriate ISO standards in relation to work undertaken) (Job specifications documents: instructions from supervisor/person-in-charge, operational drawings; approved sketches/illustrations)	1	2	-	-
PC10. prepare and maintain the work area as per procedure or operation specification	1	2	-	-
PC11. confirm with the machine setter that the machine is ready for production	-	2	-	-
PC12. seek any necessary instruction/training on the operation of the various milling machines, where appropriate (Milling machines: horizontal milling machine, vertical milling machine)	-	3	-	-
PC13. ensure that machine guards are in place and are correctly adjusted	1	2	-	-
PC14. identify different types of cutters used in horizontal and vertical milling machines	-	3	-	-
PC15. identify different parts of the vertical and horizontal milling machine	-	3	-	-
PC16. hold components securely, without distortion	-	2	-	-
PC17. ensure that machine settings are adjusted as and when required to maintain the required accuracy and quality standards (Quality standards: 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 63in or 1.6m; angles within +/- 1 degree)	1	2	-	-
<i>Carry out operations on conventional milling machine</i>	8	42	-	-
PC18. operate the machine controls in both hand and power modes	-	3	-	-
PC19. stop the machine in both normal and emergency situations, and use the correct procedure for restarting after an emergency	1	2	-	-
PC20. use British and metric systems of measurement	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21. perform various milling operations to produce various features on metal and non-metal components (Milling operations: e.g. milling of flat surfaces; gang and straddle milling; milling of sunk and recessed surfaces, face milling, side milling, angular milling, slotting, slitting, keyway cutting, face slot cutting, woodruff cutting, dovetail cutting, etc. Features: 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) Metal and non-metals: Different materials: steel/stainless steel, aluminum/aluminum alloys, copper/copper alloys, cast iron, plastic)	1	4	-	-
PC22. produce components as per given quality standards (Components quality standards as per the process: e.g. 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 63in or 1.6m; angles within +/- 1 degree, etc.)	1	4	-	-
PC23. plan and work accordingly to achieve given production targets	1	4	-	-
PC24. overcome the effects of backlash in machine slides and screws	1	2	-	-
PC25. apply roughing and finishing cuts considering the effect on tool life, surface finish and dimensional accuracy	-	3	-	-
PC26. apply cutting fluids with regard to a range of different materials	-	3	-	-
PC27. clamp the workpiece securely and without distortion in a chuck/work holding device such as vice, V-block, clamp, angle plate, etc.	-	3	-	-
PC28. report any difficulties or problems that may arise with the milling activities, and carry out any agreed actions	1	2	-	-
PC29. shut down the equipment to a safe condition on completion of the milling activities (Safe conditions: correctly isolated; cleaning the machine; removing and disposing of waste correctly)	-	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC30. use range of equipment to check critical parameters (Range of checking equipment: e.g. tri-square, bevel protractor, vernier caliper, micrometers (internal, external, depth), height gauge, go-no-go gauges, spring caliper, etc.) (Critical parameters: dimensions, squareness, hole size/fit, angles, flatness; surface finish; slots; recesses)	-	3	-	-
PC31. perform the checks to be carried out on the components before removing them from the machine, and on the equipment needed for this activity	1	3	-	-
PC32. ensure that the quality control procedures are used while operating the equipment	-	2	-	-
<i>Handle unresolved problems</i>	2	4	-	-
PC33. refer the problem to a competent internal specialist if it cannot be resolved	1	2	-	-
PC34. obtain help or advice from the specialist if the problem is outside his/her area of competence or experience	1	2	-	-
NOS Total	17	83	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0108
NOS Name	Operate conventional milling machines
Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Machining
NSQF Level	2
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	31/03/2022
NSQC Clearance Date	26/03/2015

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CSC/N0109: 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).

Scope

This unit/task covers the following:

- Work safely
- Operate Grinding Machine
- Handle of unresolved problems
- Process Compliances

Elements and Performance Criteria

Work safely

To be competent, the user/individual on the job must be able to:

- PC1.** comply with health and safety, environmental and other relevant regulations and guidelines at work
- PC2.** adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing fabrication and fitting operations (Personal protective equipment: e.g. correctly fitting overalls and safety glasses; long hair is tied back or netted; covered shoes; removing any jewellery or other items that can become entangled in the machinery, etc.)
- PC3.** work following laid down procedures and instructions
- PC4.** ensure work area is clean and safe from hazards (Hazards: revolving/moving parts of machinery; sparks/airborne particles; bursting grinding wheels; insecure components; burrs and sharp edges on components, etc.)
- PC5.** ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition (Safe conditions: correctly isolated; cleaning the machine; removing and disposing of waste correctly)

Operate Grinding Machine

To be competent, the user/individual on the job must be able to:

- PC6.** ensure availability of job specification from a valid source (Job specifications: instructions from supervisor/person-in-charge, operational drawings; approved sketches/illustrations Valid sources: supervisor, job instruction sheet/job card; work drawings and instructions)
- PC7.** read and establish job requirements from the job specification document (to include symbols and conventions to appropriate ISO standards in relation to work undertaken) (Job specifications documents: instructions from supervisor/person-in-charge, operational drawings; approved sketches/illustrations)

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- PC8.** check that all measuring equipment are within calibration date (Measuring equipment: external micrometres, surface finish equipment (eg. comparison plates, machines)
- PC9.** obtain and prepare the appropriate materials, tools and equipment (Material: low carbon/mild steel, cast iron, plastic/nylon/composite, high carbon steel, brass/brass alloys, aluminium/aluminium alloys, other specific material)
- PC10.** ensure that the incoming components used are free from foreign objects, dirt or other contamination
- PC11.** ensure that the incoming components used are free from foreign objects, dirt or other contamination
- PC12.** plan to carry out the required turning activities and the sequence of operations as per specifications
- PC13.** mount the work-piece safely and securely, in line with instructions
- PC14.** set and adjust the machine tool speeds and feeds, in line with instructions
- PC15.** use the machine tool controls safely and correctly, in line with operational procedures
- PC16.** prepare grinding wheels through various methods (Methods: dressing and `truing up' grinding wheels; wheel forming (e.g. chamfers, radii, angular forms, profiles); relieving the wheel sides)
- PC17.** grind components to produce various features (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)
- PC18.** report any difficulties or problems that may arise with the grinding activities, and carry out any agreed actions (Problems: defects caused by glazed wheels; inappropriate feeds/speeds; damage by work-holding devices and how these can be overcome)
- PC19.** shut down the equipment to a safe condition on completion of the grinding activities (Safe conditions: correctly isolated; cleaning the machine; removing and disposing of waste correctly)
- PC20.** check the quality of output, using measuring equipment appropriate to the aspects being checked and the tolerances to be achieved (Checks: 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)
- PC21.** check the machined component for accuracy in dimensions, parallelism and surface texture as per job specifications
- PC22.** ensure that the quality control procedures are used while operating the equipment

Handle the unresolved problems

To be competent, the user/individual on the job must be able to:

- PC23.** refer the problem to a competent internal specialist if it cannot be resolved
- PC24.** obtain help or advice from the specialist if the problem is outside his/her area of competence or experience

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, and procedures followed in the company

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- KU2.** legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
- KU3.** relevant health and safety requirements applicable in the workplace
- KU4.** importance of working in a clean and safe environment
- KU5.** own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU6.** reporting structure, inter-dependent functions, lines and procedures in the work area
- KU7.** relevant people and their responsibilities within the work area
- KU8.** escalation matrix and procedures for reporting work and employment related issues
- KU9.** documentation and related procedures applicable in the context of employment and work
- KU10.** importance and purpose of documentation in the context of employment and work
- KU11.** safety mechanisms on the machine, and the procedure for checking that they function correctly
- KU12.** 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
- KU13.** importance of keeping the work area clean and tidy (eg. cleaning the machine, disposal of waste, ensuring any spilt cutting fluids are correctly dealt with)
- KU14.** 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)
- KU15.** how to mount the work-piece in the work-holding devices (Workholding devices: magnetic chuck or blocks; angle plates; chucks; fixed vice; vee block and clamps; centres; swivel or universal vice; fixtures; mandrels)
- KU16.** effects of clamping the work-piece in a chuck/work holding device, and how this can cause damage or distortion in the finished components
- KU17.** how to check that the grinding wheels are in a safe and serviceable condition (eg. free from damage, cracks, correctly balanced)
- KU18.** need for 'truing up' and dressing of wheels to prevent glazing and burning of the workpiece, and methods of forming the wheels to the required profile (e.g. use of pantograph, diamond dressing units)
- KU19.** effects of backlash in machine slides and screws, and how this can be overcome
- KU20.** techniques of taking trial cuts and checking dimensional accuracy
- KU21.** application of roughing and finishing cuts, and the effect on tool life, surface finish and dimensional accuracy
- KU22.** types of grinding wheels, cutting feeds and speeds to be used, and the depth of cut that can be taken
- KU23.** application of cutting fluids with regard to a range of different materials, and why some materials do not require cutting fluids to be used
- KU24.** how to recognize grinding faults, and how to identify when grinding wheels need dressing
- KU25.** 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)

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- KU26.** problems that can occur with the grinding activities and how to address them (Problems: defects caused by glazed wheels; inappropriate feeds/speeds; damage by work-holding devices and how these can be overcome)
- KU27.** importance of leaving the machine in a safe condition on completion of activities (Safe conditions: correctly isolated; cleaning the machine; removing and disposing of waste correctly)
- KU28.** safe working practices and procedures to be followed when preparing and using grinding machines (Safe working practices: e.g. 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.)
- KU29.** hazards associated with the grinding operations and how they can be minimized (Hazards: revolving/moving parts of machinery; sparks/airborne particles; bursting grinding wheels; insecure components; burrs and sharp edges on components, etc.)
- KU30.** personal protective equipment (PPE) to be worn for the grinding activities and personal safety measures taken (Personal protective equipment: e.g. correctly fitting overalls and safety glasses; long hair is tied back or netted; covered shoes; removing any jewellery or other items that can become entangled in the machinery, etc.)

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language
- GS2.** fill up appropriate technical forms, process charts, activity logs as per the organizational format in English and/or local language
- GS3.** undertake numerical operations, and calculations/ formulae (Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)
- GS4.** identify and draw various basic, compound and solid shapes as per dimensions given (Basic shapes: square, rectangle, triangle, circle Compound shapes: involving squares, rectangles, triangles, circles, semicircles, quadrants of a circle Solid shapes: cube, rectangular prism, cylinder)
- GS5.** use appropriate measuring techniques and units of measurement
- GS6.** use appropriate units and number systems to express the degree of accuracy (Units and number systems representing the degree of accuracy: decimals places, significant figures, fractions as a decimal quantity)
- GS7.** use metric systems of measurement
- GS8.** convey and share technical information clearly using appropriate language
- GS9.** check and clarify task-related information
- GS10.** liaise with appropriate authorities using the correct protocol
- GS11.** communicate with people in a respectful form and manner in line with organizational protocol
- GS12.** plan, prioritize and sequence work operations as per job requirements
- GS13.** organize and analyze information relevant to work

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- GS14.** basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS15.** exercise restraint while expressing dissent and during conflict situations
- GS16.** avoid and manage distractions to be disciplined at work
- GS17.** manage own time for achieving better results
- GS18.** work in a team in order to achieve better results
- GS19.** identify and clarify work roles within a team
- GS20.** communicate and cooperate with others in the team for better results
- GS21.** seek assistance from fellow team members
- GS22.** identify problems with work planning, procedures, output and behaviour and their implications
- GS23.** prioritize and plan for problem-solving
- GS24.** communicate problems appropriately to others
- GS25.** identify sources of information and support for problem-solving
- GS26.** seek assistance and support from other sources to solve problems
- GS27.** identify effective resolution techniques
- GS28.** select and apply resolution techniques
- GS29.** seek evidence for problem resolution
- GS30.** undertake and express new ideas and initiatives to others
- GS31.** modify the work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS32.** participate in improvement procedures including process, quality and internal/external customer/supplier relationships
- GS33.** enhance ones competencies in new and different situations and contexts to achieve more
- GS34.** participate in on-the-job and other learning, training and development interventions and assessment
- GS35.** clarify task-related information with appropriate personnel or technical adviser
- GS36.** seek to improve and modify own work practices
- GS37.** maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work safely</i>	3	15	-	-
PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work	1	3	-	-
PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing fabrication and fitting operations (Personal protective equipment: e.g. correctly fitting overalls and safety glasses; long hair is tied back or netted; covered shoes; removing any jewellery or other items that can become entangled in the machinery, etc.)	1	3	-	-
PC3. work following laid down procedures and instructions	1	3	-	-
PC4. ensure work area is clean and safe from hazards (Hazards: revolving/moving parts of machinery; sparks/airborne particles; bursting grinding wheels; insecure components; burrs and sharp edges on components, etc.)	-	3	-	-
PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition (Safe conditions: correctly isolated; cleaning the machine; removing and disposing of waste correctly)	-	3	-	-
<i>Operate Grinding Machine</i>	16	56	-	-
PC6. ensure availability of job specification from a valid source (Job specifications: instructions from supervisor/person-in-charge, operational drawings; approved sketches/illustrations Valid sources: supervisor, job instruction sheet/job card; work drawings and instructions)	1	2	-	-
PC7. read and establish job requirements from the job specification document (to include symbols and conventions to appropriate ISO standards in relation to work undertaken) (Job specifications documents: instructions from supervisor/person-in-charge, operational drawings; approved sketches/illustrations)	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC8. check that all measuring equipment are within calibration date (Measuring equipment: external micrometres, surface finish equipment (eg. comparison plates, machines)	-	4	-	-
PC9. obtain and prepare the appropriate materials, tools and equipment (Material: low carbon/mild steel, cast iron, plastic/nylon/composite, high carbon steel, brass/brass alloys, aluminium/aluminium alloys, other specific material)	2	4	-	-
PC10. ensure that the incoming components used are free from foreign objects, dirt or other contamination	-	3	-	-
PC11. ensure that the incoming components used are free from foreign objects, dirt or other contamination	-	4	-	-
PC12. plan to carry out the required turning activities and the sequence of operations as per specifications	1	3	-	-
PC13. mount the work-piece safely and securely, in line with instructions	-	5	-	-
PC14. set and adjust the machine tool speeds and feeds, in line with instructions	2	4	-	-
PC15. use the machine tool controls safely and correctly, in line with operational procedures	1	3	-	-
PC16. prepare grinding wheels through various methods (Methods: dressing and 'truing up' grinding wheels; wheel forming (e.g. chamfers, radii, angular forms, profiles); relieving the wheel sides)	3	4	-	-
PC17. grind components to produce various features (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)	2	4	-	-
PC18. report any difficulties or problems that may arise with the grinding activities, and carry out any agreed actions (Problems: defects caused by glazed wheels; inappropriate feeds/speeds; damage by work-holding devices and how these can be overcome)	-	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC19. shut down the equipment to a safe condition on completion of the grinding activities (Safe conditions: correctly isolated; cleaning the machine; removing and disposing of waste correctly)	-	3	-	-
PC20. check the quality of output, using measuring equipment appropriate to the aspects being checked and the tolerances to be achieved (Checks: 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)	1	3	-	-
PC21. check the machined component for accuracy in dimensions, parallelism and surface texture as per job specifications	1	3	-	-
PC22. ensure that the quality control procedures are used while operating the equipment	1	2	-	-
<i>Handle the unresolved problems</i>	2	8	-	-
PC23. refer the problem to a competent internal specialist if it cannot be resolved	-	4	-	-
PC24. obtain help or advice from the specialist if the problem is outside his/her area of competence or experience	2	4	-	-
NOS Total	21	79	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0109
NOS Name	Operate grinding machines
Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Machining
NSQF Level	2
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	31/03/2022
NSQC Clearance Date	19/05/2015

Qualification Pack

CSC/N0110: Operate conventional turning machines

Description

This unit covers performing turning operations on machines such as centre lathes to produce a range of metal and plastic 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).

Scope

This unit/task covers the following:

- Work safely
- Prepare for operating conventional turning machine
- Carry out operations on conventional turning machine
- Handle of unresolved problems

Elements and Performance Criteria

Work safely

To be competent, the user/individual on the job must be able to:

- PC1.** comply with health and safety, environmental and other relevant regulations and guidelines at work
- PC2.** adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing turning operations (Personal protective equipment: correctly fitting overalls; safety glasses; long hair is tied back or netted; removing any jewellery or other items that can become entangled in the machinery; covered shoes; face mask)
- PC3.** ensure the 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
- PC6.** read and understand safety instructions, warning signs on the machine

Prepare for operating conventional turning machine

To be competent, the user/individual on the job must be able to:

- PC7.** check that all measuring equipment is within calibration date
- PC8.** ensure availability of job specification from a valid source (Job specifications: instructions from supervisor/person-in-charge, operational drawings; approved sketches/illustrations) (Valid sources: supervisor, job instruction sheet/job card; work drawings and Instructions)
- PC9.** read and establish job requirements from the job specification document to include symbols and conventions to appropriate ISO standards in relation to work undertaken (Job specifications documents: instructions from supervisor/person-in-charge, operational drawings; approved sketches/illustrations)
- PC10.** ensure that the incoming components used are free from foreign objects, dirt or other contamination

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- PC11.** prepare and maintain the work area as per procedure or operation specification
- PC12.** plan to carry out the required turning activities and the sequence of operations as per specifications
- PC13.** apply safe working practices and procedures at all times
- PC14.** obtain all the appropriate materials, tools and equipment required for the turning operation
- PC15.** confirm with the machine setter that the machine is ready for production
- PC16.** prepare for the turning activities by mounting, positioning and correctly setting a range of work holding devices and cutting tools (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 work holding devices (e.g. wax chucks), tailstock, center and carrier Cutting tools: turning, facing, boring, knurling, parting off, forming, recessing/grooving, chamfering, centre drills, twist/core drills, reamers, thread tools and dies)
- PC17.** seek any necessary instruction/training on the operation of the machine, where required
- PC18.** hold components securely, without distortion
- PC19.** ensure that machine settings are adjusted as and when required to maintain the required accuracy

Carry out operations on conventional turning machine

To be competent, the user/individual on the job must be able to:

- PC20.** set and adjust the machine tool speeds and feeds to achieve the component specification
- PC21.** mount and set the required work holding devices, workpiece and cutting tools
- PC22.** operate the machine tool controls safely and correctly, in line with operational procedures
- PC23.** control the machine in both hand and power modes for normal operations
- PC24.** stop the machine in both normal and emergency situations correctly, and follow the right procedure for restarting after an emergency
- PC25.** use lathes and the accessories that consist of the saddle, capstan/turret head, compound slide, tailstock, taper turning attachments, profile attachments, fixed and travelling steadies
- PC26.** position and secure work holding devices to the machine spindle
- PC27.** perform turning operations using various equipments to produce components with various features (Equipment: solid high-speed tooling, brazed tip tooling, interchangeable tipped tooling, indexable insert tooling Component 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)
- PC28.** produce components as per given quality standards (Components quality standards as per the process: e.g. components to be free from false tool cuts, burrs and sharp edges, general dimensional tolerance $\pm 0.05\text{mm}$, there must be one or more specific dimensional tolerances within $\pm 0.1\text{mm}$, surface finish 1.6m , reamed holes within H7, screw threads medium fit (to suit mating part/gauge), angles within ± 0.5 degree, etc.)
- PC29.** achieve given production targets
- PC30.** overcome the effects of backlash in machine slides and screws
- PC31.** perform the technique of trial cut for checking dimensional accuracy
- PC32.** apply roughing and finishing cuts, considering the effect on tool life, surface finish and dimensional accuracy

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- PC33.** use cutting fluids for different materials (Different materials: steel/stainless steel, aluminium/aluminium alloys, copper/copper alloys, cast iron, plastic)
- PC34.** report any difficulties or problems that may arise with the turning activities, and carry out any agreed actions
- PC35.** shut down the equipment to a safe condition on completion of the turning activities (Safe conditions: correctly isolated; cleaning the machine; removing and disposing of waste correctly)
- PC36.** use range of equipment to check critical parameters (Range of checking equipment: e.g. external micrometers, vernier/digital/dial calipers, dial test indicators (DTI), surface finish equipment (eg. comparison plates), steel rules, micrometers (internal, depth), depth verniers, gauges (slip, bore/hole), thread gauges (eg. ring, plug, profile), gauges (plug, ring, radius/profile), protractors, etc. Critical parameters: 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, straightness, squareness)
- PC37.** clamp the workpiece in a chuck/work holding device
- PC38.** perform the checks to be carried out on the components before removing them from the machine, and the equipment needed for this activity
- PC39.** ensure that the quality control procedures are used while operating the equipment

Handle the unresolved problems

To be competent, the user/individual on the job must be able to:

- PC40.** refer the problem to a competent internal specialist if it cannot be resolved
- PC41.** obtain help or advice from specialist if the problem is outside his/her area of competence or experience

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
- KU2.** relevant health and safety requirements applicable in the workplace
- KU3.** importance of working in clean and safe environment
- KU4.** own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU5.** reporting structure, inter-dependent functions, lines and procedures in the work area
- KU6.** relevant people and their responsibilities within the work area
- KU7.** escalation matrix and procedures for reporting work and employment related issues
- KU8.** documentation and related procedures applicable in the context of employment and work
- KU9.** importance and purpose of documentation in the context of employment and work
- KU10.** wear personal protective equipment to be worn can be obtained
- KU11.** where to obtain the component drawings, specifications and/or job instructions required for the components to be machined
- KU12.** hazards associated with the turning operations and how they can be minimized

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- KU13.** meaning and purpose of turning
- KU14.** safety mechanisms on the machine, and the procedure for checking that they function correctly
- KU15.** how to tighten all the bolts, cam locks or other securing devices securely
- KU16.** importance of keeping the work area clean and tidy
- KU17.** how to use metric systems of measurement
- KU18.** main features of the lathes and the accessories that can be used (Accessories: e.g. saddle, compound slide, tailstock, taper turning attachments, profile attachments, fixed and travelling stays, etc.)
- KU19.** classification and purpose of various accessories
- KU20.** tool materials (classification, properties and use)
- KU21.** how to identify the factors that affect the selection of cutting feeds and speed and the depth of cut that can be taken
- KU22.** the turning operations that can be performed using various equipment, and the component features produced on metal and non-metal components (Equipment: solid high-speed tooling, brazed tip tooling, interchangeable tipped tooling, indexable insert tooling
Component 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)
- KU23.** effects of backlash in machine slides and screws, and how this can be overcome
- KU24.** safety instructions and warning signs on the machine
- KU25.** types of cutting fluids and their properties
- KU26.** effects of clamping the workpiece in a chuck/work holding device, and how this can cause distortion in the finished components
- KU27.** problems that can occur with the turning activities, and how these can be overcome
- KU28.** correct equipment and procedure to use for checking critical quality parameters (Range of checking equipment: e.g external micrometres, vernier/digital/dial callipers, dial test indicators (DTI), surface finish equipment (eg. comparison plates), steel rules, micrometres (internal, depth), depth verniers, gauges (slip, bore/hole), thread gauges (eg. ring, plug, profile), gauges (plug, ring, radius/profile), protractors, etc.) (Critical parameters: 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, straightness, squareness)
- KU29.** production cost, machine hour rate, raw material cost, tool cost, coolant cost, overheads, cycle time, idle time, cost of machine idling, part rejection cost
- KU30.** selection of cutting tools, tool materials, chip breaker geometry, selecting cutting parameters from tool catalogues, selecting coolant
- KU31.** relationship between surface finish, tool nose radius, speed and feed rate
- KU32.** impact of depth of cut on chatter, surface finish
- KU33.** extent of their own authority and to whom they should report if they have problems that they cannot resolve

Generic Skills (GS)

User/individual on the job needs to know how to:

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- GS1.** read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language
- GS2.** fill up appropriate technical forms, process charts, activity logs as per the organizational format in English and/or local language
- GS3.** undertake numerical operations, and calculations/ formulae (Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages) (Algebraic expressions: represent numerical quantities using symbols, apply laws of precedence in the use of precedence (BODMAS)
- GS4.** identify and draw various basic, compound and solid shapes as per dimensions given (Basic shapes: square, rectangle, triangle, circle) (Compound shapes: involving squares, rectangles, triangles, circles, semicircles, quadrants of a circle) (Solid shapes: cube, rectangular prism, cylinder)
- GS5.** use appropriate measuring techniques and units of measurement
- GS6.** use appropriate units and number systems to express the degree of accuracy (Units and number systems representing the degree of accuracy: decimals places)
- GS7.** significant figures, fractions as a decimal quantity
- GS8.** convey and share technical information clearly using appropriate language
- GS9.** check and clarify task-related information
- GS10.** liaise with appropriate authorities using the correct protocol
- GS11.** communicate with people in a respectful form and manner in line with organizational protocol
- GS12.** plan, prioritize and sequence work operations as per job requirements
- GS13.** organize and analyze information relevant to work
- GS14.** basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS15.** exercise restraint while expressing dissent and during conflict situations
- GS16.** avoid and manage distractions to be disciplined at work
- GS17.** manage own time for achieving better results
- GS18.** work in a team in order to achieve better results
- GS19.** identify and clarify work roles within a team
- GS20.** communicate and cooperate with others in the team for better results
- GS21.** seek assistance from fellow team members
- GS22.** identify problems with work planning, procedures, output and behaviour and their implications
- GS23.** prioritize and plan for problem-solving
- GS24.** communicate problems appropriately to others
- GS25.** identify sources of information and support for problem-solving
- GS26.** seek assistance and support from other sources to solve problems
- GS27.** identify effective resolution techniques
- GS28.** select and apply resolution techniques
- GS29.** seek evidence for problem resolution
- GS30.** undertake and express new ideas and initiatives to others



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- GS31.** modify the work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS32.** participate in improvement procedures including process, quality and internal/external customer/supplier relationships
- GS33.** enhance ones competencies in new and different situations and contexts to achieve more
- GS34.** participate in on-the-job and other learning, training and development interventions and assessment
- GS35.** clarify task-related information with appropriate personnel or technical adviser
- GS36.** seek to improve and modify own work practices
- GS37.** maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work safely</i>	3	12	-	-
PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work	1	2	-	-
PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing turning operations (Personal protective equipment: correctly fitting overalls; safety glasses; long hair is tied back or netted; removing any jewellery or other items that can become entangled in the machinery; covered shoes; face mask)	1	2	-	-
PC3. ensure the work area is clean and safe from hazards	-	2	-	-
PC4. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition	-	2	-	-
PC5. ensure that machine guards are in place and are correctly adjusted	-	2	-	-
PC6. read and understand safety instructions, warning signs on the machine	1	2	-	-
<i>Prepare for operating conventional turning machine</i>	6	26	-	-
PC7. check that all measuring equipment is within calibration date	-	2	-	-
PC8. ensure availability of job specification from a valid source (Job specifications: instructions from supervisor/person-in-charge, operational drawings; approved sketches/illustrations) (Valid sources: supervisor, job instruction sheet/job card; work drawings and Instructions)	-	2	-	-
PC9. read and establish job requirements from the job specification document to include symbols and conventions to appropriate ISO standards in relation to work undertaken (Job specifications documents: instructions from supervisor/person-in-charge, operational drawings; approved sketches/illustrations)	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. ensure that the incoming components used are free from foreign objects, dirt or other contamination	-	2	-	-
PC11. prepare and maintain the work area as per procedure or operation specification	1	2	-	-
PC12. plan to carry out the required turning activities and the sequence of operations as per specifications	1	2	-	-
PC13. apply safe working practices and procedures at all times	1	2	-	-
PC14. obtain all the appropriate materials, tools and equipment required for the turning operation	-	2	-	-
PC15. confirm with the machine setter that the machine is ready for production	-	2	-	-
PC16. prepare for the turning activities by mounting, positioning and correctly setting a range of work holding devices and cutting tools (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 work holding devices (e.g. wax chucks), tailstock, center and carrier Cutting tools: turning, facing, boring, knurling, parting off, forming, recessing/grooving, chamfering, centre drills, twist/core drills, reamers, thread tools and dies)	1	2	-	-
PC17. seek any necessary instruction/training on the operation of the machine, where required	-	2	-	-
PC18. hold components securely, without distortion	-	2	-	-
PC19. ensure that machine settings are adjusted as and when required to maintain the required accuracy	1	2	-	-
<i>Carry out operations on conventional turning machine</i>	11	38	-	-
PC20. set and adjust the machine tool speeds and feeds to achieve the component specification	1	2	-	-
PC21. mount and set the required work holding devices, workpiece and cutting tools	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. operate the machine tool controls safely and correctly, in line with operational procedures	1	2	-	-
PC23. control the machine in both hand and power modes for normal operations	1	2	-	-
PC24. stop the machine in both normal and emergency situations correctly, and follow the right procedure for restarting after an emergency	1	2	-	-
PC25. use lathes and the accessories that consist of the saddle, capstan/turret head, compound slide, tailstock, taper turning attachments, profile attachments, fixed and travelling steadies	-	1	-	-
PC26. position and secure work holding devices to the machine spindle	-	2	-	-
PC27. perform turning operations using various equipments to produce components with various features (Equipment: solid high-speed tooling, brazed tip tooling, interchangeable tipped tooling, indexable insert tooling Component 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)	2	3	-	-
PC28. produce components as per given quality standards (Components quality standards as per the process: e.g. components to be free from false tool cuts, burrs and sharp edges, general dimensional tolerance +/- 0.05mm, there must be one or more specific dimensional tolerances within +/- 0.1mm, surface finish 1.6m, reamed holes within H7, screw threads medium fit (to suit mating part/gauge), angles within +/- 0.5 degree, etc.)	-	2	-	-
PC29. achieve given production targets	-	2	-	-
PC30. overcome the effects of backlash in machine slides and screws	1	2	-	-
PC31. perform the technique of trial cut for checking dimensional accuracy	-	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC32. apply roughing and finishing cuts, considering the effect on tool life, surface finish and dimensional accuracy	1	1	-	-
PC33. use cutting fluids for different materials (Different materials: steel/stainless steel, aluminium/aluminium alloys, copper/copper alloys, cast iron, plastic)	1	2	-	-
PC34. report any difficulties or problems that may arise with the turning activities, and carry out any agreed actions	1	2	-	-
PC35. shut down the equipment to a safe condition on completion of the turning activities (Safe conditions: correctly isolated; cleaning the machine; removing and disposing of waste correctly)	-	1	-	-
PC36. use range of equipment to check critical parameters (Range of checking equipment: e.g. external micrometers, vernier/digital/dial calipers, dial test indicators (DTI), surface finish equipment (eg. comparison plates), steel rules, micrometers (internal, depth), depth verniers, gauges (slip, bore/hole), thread gauges (eg. ring, plug, profile), gauges (plug, ring, radius/profile), protractors, etc. Critical parameters: 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, straightness, squareness)	-	2	-	-
PC37. clamp the workpiece in a chuck/work holding device	-	2	-	-
PC38. perform the checks to be carried out on the components before removing them from the machine, and the equipment needed for this activity	-	2	-	-
PC39. ensure that the quality control procedures are used while operating the equipment	-	2	-	-
<i>Handle the unresolved problems</i>	1	3	-	-
PC40. refer the problem to a competent internal specialist if it cannot be resolved	1	2	-	-



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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC41. obtain help or advice from specialist if the problem is outside his/her area of competence or experience	-	1	-	-
NOS Total	21	79	-	-



Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0110
NOS Name	Operate conventional turning machines
Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Machining
NSQF Level	2
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	31/03/2022
NSQC Clearance Date	26/03/2015

Qualification Pack

CSC/N0302: Grind surface using hand and hand-held power tools

Description

This unit covers competencies required for grinding surface using hand tools and handheld power tools on a variety of ferrous and non-ferrous objects. This involves selecting appropriate grinding equipment, tools and methods to suit work requirements.

Scope

This unit/task covers the following:

- Work safely
- Prepare for grinding operations
- Perform grinding operations

Elements and Performance Criteria

Work Safely

To be competent, the user/individual on the job must be able to:

- PC1.** comply with health and safety, environmental and other relevant regulations and guidelines at work
- PC2.** adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing die fitting operations
- 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
- PC5.** ensure work area is clean and safe from hazards before and after the job is completed

Prepare for grinding operations

To be competent, the user/individual on the job must be able to:

- PC6.** obtain job specification from a valid and approved source (Valid sources: job instruction sheet/job card; work drawings and instructions; planning documentation; quality control documents; operation sheets; process specifications; instructions from supervisor)
- PC7.** 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 (Job specification documents: detailed component drawings; approved sketches/illustrations; national, international and organisational standards; reference tables and charts Job requirements: raw materials or components required (type, quality, quantity); dimensions; limits and tolerances; surface texture requirements; operations required (list, sequence and procedures where applicable); shape or profiles to be machined; instruments and tools to be used; interdependencies; timelines)
- PC9.** report and rectify incorrect and inconsistent information in job specification documents as per organization procedures
- PC10.** prepare the work area for the fitting operations as per procedure or operational specification
- PC11.** obtain correct work-pieces/raw materials and consumables as per job requirements

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- 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

Perform grinding operations

To be competent, the user/individual on the job must be able to:

- 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 (Power tools: electric, pneumatic, liquid fuel, hydraulic)
- 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 (Kinds of wheel: cut-off discs (diamond blade), abrasive grinding discs, grinding stones, wire brush wheels)
- 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
- PC24.** perform wheel dressing using diamond cutter
- PC25.** check the surface finish of the object on which grinding is done to ensure completeness of work
- PC26.** identify common surface imperfections and correct errors
- PC27.** ensure that the work-piece achieves the required characteristics and meets the finishing specification (Finishing parameters: texture, roughness)
- 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
- PC31.** complete documentation post completion of work, as per procedure (Documentation during and post operations: job card, progress records, incident reports)
- PC32.** refer unresolved job related problems to appropriate personnel for support
- PC33.** monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
- KU2.** relevant health and safety requirements applicable in the work place

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- KU3.** own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU4.** reporting structure, inter-dependent functions, lines and procedures in the work area
- KU5.** how to engage with specialists for support in order to resolve incidents and service requests
- KU6.** importance of working in clean and safe environment practices and procedures
- KU7.** relevant people and their responsibilities within the work area
- KU8.** escalation matrix and procedures for reporting work and employment related issues
- KU9.** documentation and related procedures applicable in the context of employment and work
- KU10.** kinds of common ferrous and non-ferrous metals (Metals: ferrous metals: e.g. carbon steels, stainless steels, cast iron, tool steel, hard metals, etc.; non-ferrous metals: e.g. bronze, bronze alloys, copper and copper alloys, etc.)
- KU11.** hand tool (powered and unpowered) grinding methods & techniques and terminology used in grinding procedures; which tools to use and when
- KU12.** hand and held-held power tools and equipment to be used in grinding for different types of material (Power tools: electric, pneumatic, liquid fuel, hydraulic)
- KU13.** application of hand and powered tools and how to ensure that powered tools are set up, used and closed down safely
- KU14.** procedures, tools and techniques required to set operational performance parameters
- KU15.** reasons for selecting a specific tool, method or technique for grinding operations
- KU16.** correct procedures of tools and equipment usage for the grinding operations
- KU17.** effect of different types and grades of grinding achievable by various tools to achieve required surface finish
- KU18.** importance of following specified grinding sequence and procedures
- KU19.** types and sources of appropriate job specifications (Valid sources: instructions from supervisor)
- KU20.** suitability of work pieces/materials and consumables for the specified job, its importance and procedures
- KU21.** securing the work-piece/raw material correctly using appropriate tools and mechanisms
- KU22.** various types of substrate that may require preparing and the types of tools and preparation methods that may be used on them
- KU23.** why different types of substrate require different preparation techniques to be used and the damage that may result from using inappropriate tools and techniques
- KU24.** how to identify grinding process faults, methods and techniques to check for common surface imperfections/defects and conformance to specifications
- KU25.** surface imperfections/defects that can be removed/repared
- KU26.** procedures for handling components with surface imperfections/defects that cannot be removed/repared and how can they be minimized
- KU27.** importance of tools and equipment being kept in a safe and usable condition
- KU28.** hazards associated with carrying out the grinding process
- KU29.** personal protective equipment (PPE) and clothing that must be worn during the grinding activity and from where can it be obtained
- KU30.** importance of the maintenance of a register of power tools, and the need to check tools against certification

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- KU31.** importance of completing the production documentation throughout the grinding process (Documentation during and post operations: job card, progress records, incident reports)
- KU32.** different kinds of manually operated grinders (Grinders: angle grinders, bench grinders, straight grinder, rotary die grinders, disc grinder, electronic grinder, electric or pneumatic/hydraulic grinders, pedestal grinders, cylindrical grinders)

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language (Job specification documents: detailed component drawings; approved sketches/illustrations; national, international and organisational standards; reference charts, tables, graphs; machining/assembly drawings)
- GS2.** fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
- GS3.** undertake basic numerical operations, and calculations/ formulae (Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages; Algebraic expressions: represent numerical quantities using symbols, apply laws of precedence in the use of precedence (BODMAS))
- GS4.** identify various basic, compound and solid shapes as per dimensions given (Basic shapes: square, rectangle, triangle, circle) (Compound shapes: involving squares, rectangles, triangles, circles, semi-circles, quadrants of a circle) (Solid shapes: cube, rectangular prism, cylinder)
- GS5.** use appropriate measuring techniques and units of measurement
- GS6.** use appropriate units and number systems to express degree of accuracy (Units and number systems representing degree of accuracy: decimals places, significant figures, fractions as a decimal quantity)
- GS7.** use metric systems of measurement
- GS8.** convey and share technical information clearly using appropriate language
- GS9.** check and clarify task-related information
- GS10.** liaise with appropriate authorities using correct protocol
- GS11.** communicate with people in respectful form and manner in line with organizational protocol
- GS12.** plan, prioritize and sequence work operations as per job requirements
- GS13.** organize and analyse information relevant to work
- GS14.** apply basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS15.** exercise restraint while expressing dissent and during conflict situations
- GS16.** avoid and manage distractions to be disciplined at work
- GS17.** manage own time for achieving better results
- GS18.** work in a team in order to achieve better results
- GS19.** identify and clarify work roles within a team
- GS20.** communicate and cooperate with others in the team for better results



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- GS21.** seek assistance from fellow team members
- GS22.** identify problems with work planning, procedures, output and behaviour and their implications
- GS23.** prioritize and plan for problem solving
- GS24.** communicate problems appropriately to others
- GS25.** identify sources of information and support for problem solving
- GS26.** seek assistance and support from other sources to solve problems
- GS27.** identify effective resolution techniques
- GS28.** select and apply resolution techniques
- GS29.** seek evidence for problem resolution
- GS30.** undertake and express new ideas and initiatives to others
- GS31.** modify work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS32.** participate in improvement procedures including process, quality and internal/external customer/supplier relationships
- GS33.** enhance ones competencies in new and different situations and contexts to achieve more
- GS34.** maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments
- GS35.** participate in on-the-job and other learning, training and development interventions and assessments
- GS36.** clarify task related information with appropriate personnel or technical adviser
- GS37.** seek to improve and modify own work practices

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work Safely</i>	3	10	-	-
PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work	1	2	-	-
PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing die fitting operations	1	2	-	-
PC3. work following laid down procedures and instructions	1	2	-	-
PC4. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition	-	2	-	-
PC5. ensure work area is clean and safe from hazards before and after the job is completed	-	2	-	-
<i>Prepare for grinding operations</i>	6	22	-	-
PC6. obtain job specification from a valid and approved source (Valid sources: job instruction sheet/job card; work drawings and instructions; planning documentation; quality control documents; operation sheets; process specifications; instructions from supervisor)	1	2	-	-
PC7. ensure that all measuring equipment are within calibration date and are approved for usage	-	2	-	-
PC8. read and establish job requirements from the job specification document accurately (Job specification documents: detailed component drawings; approved sketches/illustrations; national, international and organisational standards; reference tables and charts Job requirements: raw materials or components required (type, quality, quantity); dimensions; limits and tolerances; surface texture requirements; operations required (list, sequence and procedures where applicable); shape or profiles to be machined; instruments and tools to be used; interdependencies; timelines)	1	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. report and rectify incorrect and inconsistent information in job specification documents as per organization procedures	1	3	-	-
PC10. prepare the work area for the fitting operations as per procedure or operational specification	1	2	-	-
PC11. obtain correct work-pieces/raw materials and consumables as per job requirements	1	2	-	-
PC12. identify the metals, metal alloys and non-metals accurately	-	2	-	-
PC13. interpret surface finish specifications accurately	1	2	-	-
PC14. select grinding method/technique as per the work requirements	-	2	-	-
PC15. obtain appropriate tools and equipment per job requirements	-	2	-	-
<i>Perform grinding operations</i>	14	45	-	-
PC16. set work pieces as per job requirements using appropriate positioning and/or holding devices	-	3	-	-
PC17. measure and mark equipment, objects, or parts to ensure grinding standards are met	1	2	-	-
PC18. trim or scrape objects or parts, using chisels, scrapers, and other hand or power tools and equipment (Power tools: electric, pneumatic, liquid fuel, hydraulic)	-	3	-	-
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 (Kinds of wheel: cut-off discs (diamond blade), abrasive grinding discs, grinding stones, wire brush wheels)	1	2	-	-
PC20. move controls to adjust, start, or stop equipment during grinding process	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21. load and adjust work-pieces onto equipment or work tables	1	2	-	-
PC22. carry out the grinding process using and/or tools or hand-held power tools in accordance with standard operating procedures	1	4	-	-
PC23. finish job surface to specification according to requirement	1	3	-	-
PC24. perform wheel dressing using diamond cutter	1	3	-	-
PC25. check the surface finish of the object on which grinding is done to ensure completeness of work	1	2	-	-
PC26. identify common surface imperfections and correct errors	-	2	-	-
PC27. ensure that the work-piece achieves the required characteristics and meets the finishing specification (Finishing parameters: texture, roughness)	-	2	-	-
PC28. secure tools and equipment in a safe condition on completion of the processing activities	-	2	-	-
PC29. determine the kind of tools and equipment needed to do a job or repair the tools	1	2	-	-
PC30. perform routine maintenance on equipment and determining when and what kind of maintenance is needed	1	4	-	-
PC31. complete documentation post completion of work, as per procedure (Documentation during and post operations: job card, progress records, incident reports)	2	2	-	-
PC32. refer unresolved job related problems to appropriate personnel for support	1	2	-	-
PC33. monitor the problem and keep the supervisor informed about progress or any delays in resolving the problem	1	3	-	-
NOS Total	23	77	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0302
NOS Name	Grind surface using hand and hand-held power tools
Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Fitting and Assembly
NSQF Level	2
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	31/03/2022
NSQC Clearance Date	22/04/2015

CSC/N0307: Plan and co-ordinate the making of tools and die

Description

This unit covers the planning and co-ordination for making of tools and die 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.

Scope

This unit/task covers the following:

- Work safely
- Identify design requirements and planning
- Co-ordinate with others

Elements and Performance Criteria

Work safely

To be competent, the user/individual on the job must be able to:

- PC1.** adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations
- PC2.** ensure 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

Identify design requirements and planning

To be competent, the user/individual on the job must be able to:

- PC4.** obtain sample parts/ blueprints/ drawings of tools/ dies and other engineering information as per company procedures
- PC5.** identify requirements by analysing sample parts, tool design and blueprints
- PC6.** plan sequence of operations for tools & dies making keeping in mind various considerations like requirements, timelines, resources available, interdependencies, constraints, compliances, etc.
- PC7.** report and rectify cases of inappropriate information in design documents as per organizational procedures
- PC8.** compute dimensions, sizes, shapes and tolerances of sub-assemblies of the tools and dies as per specifications and as per company procedures
- PC9.** determine information such as number of parts to make, engineered components and material to be used, and machines to be used
- PC10.** identify and confirm resources required such as components, machinery, range of materials and processes (Range of Materials: Ferrous metals: e.g. carbon steels, stainless steels, cast iron, tool steel, hard metals; Non-ferrous metals: e.g. bronze, bronze alloys, copper and copper alloys)
- PC11.** identify the operations that will be required for tools & dies making based on design requirements

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- PC12.** identify type of equipment required for tools & dies making based on the operations selected
- PC13.** estimate timelines for each task accurately
- PC14.** establish milestones by determining a schedule of operations
- PC15.** obtain necessary approvals for the plan
- PC16.** allocate responsibilities to machine operators as per the operations selected
- PC17.** ensure that the machine operators are clear about the sequence of activities, priorities and considerations

Coordinate with others

To be competent, the user/individual on the job must be able to:

- PC18.** release drawings and machining specifications to machine operators
- PC19.** identify and select tools for tools & dies making based on design and blueprints
- PC20.** identify and select lifting and rigging equipment based on design and blueprints
- PC21.** select and procure appropriate metals to be used for tools & dies making as per design requirement

Coordinate with others

To be competent, the user/individual on the job must be able to:

- PC22.** hand over tools, equipment and metal components to be machined to the machine operators
- PC23.** handle all clarifications sought by the operators
- PC24.** collect job from all operators
- PC25.** check the jobs as per drawing/instruction
- PC26.** ensure in-process inspection of the tool elements and final assembly

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
- KU2.** relevant health and safety requirements applicable in the work place
- KU3.** importance of working in clean and safe environment
- KU4.** own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU5.** reporting structure, inter-dependent functions, lines and procedures in the work area
- KU6.** relevant people and their responsibilities within the work area
- KU7.** escalation matrix and procedures for reporting work and employment related issues
- KU8.** documentation and related procedures applicable in the context of employment and work
- KU9.** importance and purpose of documentation in context of employment and work
- KU10.** valid sources for information about job specifications (Valid sources: 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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- KU11.** read and establish various types of job specification documents for job requirements (Job requirements: raw materials or components required (type, quality, quantity); dimensions; limits and tolerances; surface texture requirements; operations required (list, sequence and procedures where applicable); shape or profiles to be fabricated; cutting, bending and rolling allowances for fabricated forms; instruments and tools to be used; interdependencies; timelines)
- KU12.** hazards associated with the activities (Hazards: 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)
- KU13.** the various fitting activities to be carried out (Fitting activities: 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))
- KU14.** how to extract and use information from engineering drawings and related specifications in relation to work undertaken
- KU15.** various hand fitting methods (Methods: cutting out the rough profile using saws (e.g. hacksaw, band saw), cutting a screw thread (e.g. tapping or dieing), filing (flat, square, curved), drilling holes, tapping)
- KU16.** how to interpret first and third angle drawings
- KU17.** basic principles of tool and die design
- KU18.** basic knowledge of accessing computer drawing software to be used for viewing designs drawings
- KU19.** make minor modifications in the design drawings
- KU20.** how to access the specific computer modelling software to be used
- KU21.** how to set up the viewing screen to show multiple views of the component
- KU22.** factors that affect the selection of cutting feeds and speeds, and the depth of cut that can be take (Factors: type of material, size of material, operations being performed, work holding method/security of workpiece, condition of machine, finish required, tolerance required)
- KU23.** the British and metric systems of measurement
- KU24.** geometric dimensioning and tolerancing -- GD&T
- KU25.** required dimensional parameters and components quality standards as per the process (Parameters: linear dimensions (e.g. lengths, depths); diameters (e.g. external, internal); flatness; squareness; angles; profiles; hole size and position; thread; size and fit; surface finish) (Quality standards: components to be free from false tool cuts, burrs and sharp edges; dimensional tolerance $\pm 0.020\text{mm}$; flatness and squareness 0.05mm ; angles within ± 1 degree; screw threads to fit as per standard; reamed and bored holes within interference: $- 0.025\text{mm}$ (hole) $+ 0.025\text{mm}$ (shaft), transition: $- 0.1\text{mm}$ (hole) $+ 0.1$ (shaft) , clearance: 50microns ; radius: $0.5 r$; surface finish 63in or 1.6 m)
- KU26.** how to plan and organize the team
- KU27.** machine operations and sequencing
- KU28.** machine capacity and capabilities
- KU29.** types of machine tools such as lathes, drills, grinders, saws and milling machines

Qualification Pack

- KU30.** work holding devices and equipment (Work holding devices: bench / machine vice; clamps (e.g. toolmakers); three jaw chuck; four-jaw chuck; collet chuck; drive plate and centres; magnetic chucks(holding devices); special purpose tool holders (3R for holding electrodes))
- KU31.** machining accessories
- KU32.** limits and capabilities of tooling, accessories and holding devices
- KU33.** how to check the workpiece and the measuring equipment that is used (Measuring equipment: external micrometres, vernier/digital/dial calliper, surface finish equipment (e.g. comparison plates, machines), rules, squares, protractors, depth micrometres, 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)
- KU34.** need to check that the measuring equipment is within current calibration dates, and that the instruments are correctly zeroed
- KU35.** measuring internal and external dimensions
- KU36.** how to check surface finish
- KU37.** properties of metals (Properties: plasticity, elasticity, ductility, malleability, toughness, hardness, tensile strength, compressive strength, shear strength, corrosion resistance, density)
- KU38.** heat treatment processes of tool steel

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language
- GS2.** fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
- GS3.** undertake numerical operations, geometry and calculations/ formulae (Arithmetic: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)
- GS4.** use appropriate measuring techniques
- GS5.** express numerical solutions to a degree of accuracy that is appropriate to the value being calculated (Degree of accuracy: correct to three significant figures, correct to two decimal places, express a decimal fraction in standard form, express tolerance in terms of limits of size)
- GS6.** use a calculator to raise a number to a power and determine square roots
- GS7.** use algebraic expressions to solve linear equations
- GS8.** plot and interpret straight line graphs
- GS9.** apply Pythagoras theorem to perform calculations
- GS10.** calculation of the value of angles in a triangle
- GS11.** convey and share technical information clearly using appropriate language
- GS12.** check and clarify task-related information
- GS13.** liaise with appropriate authorities using correct protocol

Qualification Pack

- GS14.** communicate with people in respectful form and manner in line with organizational protocol
- GS15.** plan, prioritize and sequence work operations as per job requirements
- GS16.** organize and analyze information relevant to work
- GS17.** basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS18.** exercise restraint while expressing dissent and during conflict situations
- GS19.** avoid and manage distractions to be disciplined at work
- GS20.** manage own time for achieving better results
- GS21.** work in a team in order to achieve better results
- GS22.** identify and clarify work roles within a team
- GS23.** communicate and cooperate with others in the team for better results
- GS24.** seek assistance from fellow team members
- GS25.** identify problems with work planning, procedures, output and behavior, and their implications
- GS26.** prioritize and plan for problem solving
- GS27.** communicate problems appropriately to others
- GS28.** identify sources of information and support for problem solving
- GS29.** seek assistance and support from other sources to solve problems
- GS30.** identify effective resolution techniques
- GS31.** select and apply resolution techniques
- GS32.** seek evidence for problem resolution
- GS33.** undertake and express new ideas and initiatives to others
- GS34.** modify work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS35.** participate in improvement procedures including process, quality and internal/external customer/supplier relationships
- GS36.** enhance ones competencies in new and different situations and contexts to achieve more
- GS37.** maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments
- GS38.** participate in on-the-job and other learning, training and development interventions and assessment
- GS39.** clarify task related information with appropriate personnel or technical adviser
- GS40.** seek to improve and modify own work practices

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work safely</i>	2	6	-	-
PC1. adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations	1	3	-	-
PC2. ensure all hand tools and equipment used are in a safe and useable condition	1	1	-	-
PC3. ensure that all machine tools are correctly guarded at all times	-	2	-	-
<i>Identify design requirements and planning</i>	15	40	-	-
PC4. obtain sample parts/ blueprints/ drawings of tools/ dies and other engineering information as per company procedures	1	3	-	-
PC5. identify requirements by analysing sample parts, tool design and blueprints	2	3	-	-
PC6. plan sequence of operations for tools & dies making keeping in mind various considerations like requirements, timelines, resources available, interdependencies, constraints, compliances, etc.	2	3	-	-
PC7. report and rectify cases of inappropriate information in design documents as per organizational procedures	-	2	-	-
PC8. compute dimensions, sizes, shapes and tolerances of sub-assemblies of the tools and dies as per specifications and as per company procedures	2	3	-	-
PC9. determine information such as number of parts to make, engineered components and material to be used, and machines to be used	2	3	-	-
PC10. identify and confirm resources required such as components, machinery, range of materials and processes (Range of Materials: Ferrous metals: e.g. carbon steels, stainless steels, cast iron, tool steel, hard metals; Non-ferrous metals: e.g. bronze, bronze alloys, copper and copper alloys)	2	3	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. identify the operations that will be required for tools & dies making based on design requirements	2	3	-	-
PC12. identify type of equipment required for tools & dies making based on the operations selected	2	3	-	-
PC13. estimate timelines for each task accurately	-	2	-	-
PC14. establish milestones by determining a schedule of operations	-	3	-	-
PC15. obtain necessary approvals for the plan	-	3	-	-
PC16. allocate responsibilities to machine operators as per the operations selected	-	3	-	-
PC17. ensure that the machine operators are clear about the sequence of activities, priorities and considerations	-	3	-	-
<i>Coordinate with others</i>	7	12	-	-
PC18. release drawings and machining specifications to machine operators	1	3	-	-
PC19. identify and select tools for tools & dies making based on design and blueprints	2	3	-	-
PC20. identify and select lifting and rigging equipment based on design and blueprints	2	3	-	-
PC21. select and procure appropriate metals to be used for tools & dies making as per design requirement	2	3	-	-
<i>Coordinate with others</i>	6	12	-	-
PC22. hand over tools, equipment and metal components to be machined to the machine operators	-	2	-	-
PC23. handle all clarifications sought by the operators	2	2	-	-
PC24. collect job from all operators	-	2	-	-
PC25. check the jobs as per drawing/instruction	2	3	-	-



Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC26. ensure in-process inspection of the tool elements and final assembly	2	3	-	-
NOS Total	30	70	-	-



Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0307
NOS Name	Plan and co-ordinate the making of tools and die
Sector	Capital Goods
Sub-Sector	Machine Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery
Occupation	Fitting and Assembly
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	31/03/2022
NSQC Clearance Date	19/05/2015

Qualification Pack

CSC/N0308: Perform fitting operations on metal components for making tools and dies using hand tools and manually operated machines

Description

This unit covers fitting of metal components for making tools and dies using handtools 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.

Scope

This unit/task covers the following:

- Work safely
- Prepare for fitting operations
- Mark components
- Perform fitting operations

Elements and Performance Criteria

Work safely

To be competent, the user/individual on the job must be able to:

- PC1.** comply with health and safety, environmental and other relevant regulations and guidelines at work
- PC2.** adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing die 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

Prepare for fitting operations

To be competent, the user/individual on the job must be able to:

- PC6.** obtain job specification from a valid and approved source (Valid sources: job instruction sheet/job card; work drawings and instructions; planning documentation; quality control documents; operation sheets; process specifications; instructions from supervisor)
- PC7.** read and establish job requirements from the job specification document accurately (Job specification documents: detailed component drawings; approved sketches/illustrations; national, international and organisational standards; reference tables and charts Job requirements: raw materials or components required (type, quality, quantity); dimensions; limits and tolerances; surface texture requirements; operations required (list, sequence and procedures where applicable); shape or profiles to be machined; instruments and tools to be used; interdependencies; timelines)
- 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

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- 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 (Positioning and holding devices: belts; braces; clamps; jigs and fixtures; bolt straps; blocks and tables; manual lifts; ropes; jacks)

Mark components

To be competent, the user/individual on the job must be able to:

- PC15.** mark out specified features with the help of marking-out methods and techniques on the workpieces as per job specification by using appropriate measuring and marking out tools and equipment (Features: 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: direct marking using instruments, use of templates, tracing/transfer methods Measuring and marking tools: scales/tapes, dividers/trammels, scribes, punches, scribing blocks, squares, protractor, depth/internal/external micrometres, callipers (vernier, inside and outside, depth), gauges (height Vernier, feeler, bore/hole, slip, radius/profile, thread, plug), stick micrometres, dial stand and comparator, vee block with u-clamp)
- 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

Perform fitting operations

To be competent, the user/individual on the job must be able to:

- PC18.** perform fitting operations on various forms of metal components using a range of hand tools and manually operated machines (Forms of metal components: square/rectangular (e.g. bar stock, sheet material, machined components); circular/cylindrical (e.g. bar stock, tubes, turned components, flat discs); sections (e.g. angles, channel, tee section, joists, extrusions); irregular shapes/profile (e.g. castings, forgings, odd shaped components) Fitting operations: filing, drilling, chiselling, threading(external, internal), hand tapping, scraping, manual lapping Hand tools: hammers; punches; screwdrivers; sockets; wrenches; spanners; scraper; chisels; gouges; files; taps; vices and clamps Manually operated machine tools: drills (power drills, pedestal drills), punching machines, threading 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 (Dimensional parameters: linear dimensions; flatness; squareness; depths; angles; profiles; hole position; hole size/fit; thread size and fit)
- PC23.** produce components with various features as per standards applicable to the process (Features: 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; counter bore, countersink, or spot face; chamfers; reamed holes; faces which are square to each other; faces which are parallel to each other)

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- 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 (Documentation: job card, progress records, incident reports)
- 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 (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
- KU2.** relevant health and safety requirements applicable in the work place
- KU3.** importance of working in clean and safe environment
- KU4.** own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU5.** reporting structure, inter-dependent functions, lines and procedures in the work area
- KU6.** relevant people and their responsibilities within the work area
- KU7.** escalation matrix and procedures for reporting work and employment related issues
- KU8.** documentation and related procedures applicable in the context of employment and work
- KU9.** importance and purpose of documentation in context of employment and work
- KU10.** specific safe working practices, fitting procedures and environmental regulations that must be observed
- KU11.** hazards associated with carrying out the fitting operations and how can they be minimized
- KU12.** personal protective equipment to be used during the fitting activities and where can it be obtained
- KU13.** types and sources of appropriate job specifications
- KU14.** common terminology used in fitting
- KU15.** importance of following specified fitting sequences and procedures
- KU16.** importance and procedures of ensuring suitability of workpiece/materials and consumables for the specified job (Suitability of workpieces/materials and consumables: e.g. correct type and code; correct form; correct dimensions; damage free; correctly issued)
- KU17.** tools and equipment used for the fitting operations
- KU18.** importance and procedures to ensure that tools and equipment are in a safe and usable condition
- KU19.** correct techniques and procedures to carry out specific fitting operations by hand tools and manually operated machines
- KU20.** importance of securing the workpiece/raw material correctly using appropriate devices and mechanisms
- KU21.** common problems that can occur in the fitting operations and their implications

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- KU22.** correct procedures to address problems commonly encountered during fitting operations
- KU23.** importance of reporting problems immediately and accurately
- KU24.** meaning and importance of quality in relation to final and intermediate job output
- KU25.** how to check the quality of the shaped components against the specified quality standards
- KU26.** range of materials used in relevant fitting applications (Range of Materials: Ferrous metals: e.g. carbon steels, stainless steels, cast iron, tool steel, hard metals; Non-ferrous metals: e.g. bronze, bronze alloys, copper and copper alloys Quality standards: 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 +/- 0.5 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)
- KU27.** relevant mechanical properties of metals and implications for job (Mechanical properties: tensile strength, toughness, hardness, elasticity, ductility, malleability Identifiable properties: colour, appearance, sparks)
- KU28.** importance of using correct procedures as per type and form of materials and metal components

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language
- GS2.** fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
- GS3.** undertake numerical operations, and calculations/ formulae (Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)
- GS4.** identify and draw various basic, compound and solid shapes as per dimensions given (Basic shapes: square, rectangle, triangle, circle Compound shapes: involving squares, rectangles, triangles, circles, semicircles, quadrants of a circle Solid shapes: cube, rectangular prism, cylinder)
- GS5.** use appropriate measuring techniques and units of measurement
- GS6.** use appropriate units and number systems to express degree of accuracy (Units and number systems representing degree of accuracy: decimals places, significant figures, fractions as a decimal quantity)
- GS7.** interpret and express tolerance in terms of limits on dimensions
- GS8.** calculation of the value of angles in a triangle (Angles in a triangle: right-angled, isosceles, equilateral)
- GS9.** convey and share technical information clearly using appropriate language
- GS10.** check and clarify task-related information
- GS11.** liaise with appropriate authorities using correct protocol
- GS12.** communicate with people in respectful form and manner in line with organizational protocol
- GS13.** plan, prioritize and sequence work operations as per job requirements



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- GS14.** organize and analyse information relevant to work
- GS15.** basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS16.** exercise restraint while expressing dissent and during conflict situations
- GS17.** avoid and manage distractions to be disciplined at work
- GS18.** manage own time for achieving better results
- GS19.** work in a team in order to achieve better results
- GS20.** identify and clarify work roles within a team
- GS21.** communicate and cooperate with others in the team for better results
- GS22.** seek assistance from fellow team members
- GS23.** identify problems with work planning, procedures, output and behavior and their implications
- GS24.** prioritize and plan for problem solving
- GS25.** communicate problems appropriately to others
- GS26.** identify sources of information and support for problem solving
- GS27.** seek assistance and support from other sources to solve problems
- GS28.** identify effective resolution techniques
- GS29.** select and apply resolution techniques
- GS30.** seek evidence for problem resolution
- GS31.** undertake and express new ideas and initiatives to others
- GS32.** modify work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS33.** participate in improvement procedures including process, quality and internal/external customer/supplier relationships
- GS34.** enhance ones competencies in new and different situations and contexts to achieve more
- GS35.** maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments
- GS36.** participate in on-the-job and other learning, training and development interventions and assessment
- GS37.** clarify task related information with appropriate personnel or technical adviser
- GS38.** seek to improve and modify own work practices

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work safely</i>	3	12	-	-
PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work	1	3	-	-
PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing die fitting operations	1	3	-	-
PC3. work following laid down procedures and instructions	1	2	-	-
PC4. ensure work area is clean and safe from hazards	-	2	-	-
PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition	-	2	-	-
<i>Prepare for fitting operations</i>	4	19	-	-
PC6. obtain job specification from a valid and approved source (Valid sources: job instruction sheet/job card; work drawings and instructions; planning documentation; quality control documents; operation sheets; process specifications; instructions from supervisor)	-	2	-	-
PC7. read and establish job requirements from the job specification document accurately (Job specification documents: detailed component drawings; approved sketches/illustrations; national, international and organisational standards; reference tables and charts Job requirements: raw materials or components required (type, quality, quantity); dimensions; limits and tolerances; surface texture requirements; operations required (list, sequence and procedures where applicable); shape or profiles to be machined; instruments and tools to be used; interdependencies; timelines)	-	2	-	-
PC8. report and rectify incorrect and inconsistent information in job specification documents as per organization procedures	-	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. prepare the work area for the fitting operations as per procedure or operational specification	1	2	-	-
PC10. ensure that all measuring equipment is calibrated and approved for usage	-	2	-	-
PC11. ensure that the components used are free from foreign objects, dirt or other contamination	-	2	-	-
PC12. obtain correct workpieces/raw materials and consumables as per job requirements	1	2	-	-
PC13. obtain appropriate tools and equipment as per job requirements	1	2	-	-
PC14. set work pieces as per job requirements using appropriate positioning and/or holding devices and support mechanisms (Positioning and holding devices: belts; braces; clamps; jigs and fixtures; bolt straps; blocks and tables; manual lifts; ropes; jacks)	1	3	-	-
<i>Mark components</i>	3	9	-	-
PC15. mark out specified features with the help of marking-out methods and techniques on the workpieces as per job specification by using appropriate measuring and marking out tools and equipment (Features: 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: direct marking using instruments, use of templates, tracing/transfer methods Measuring and marking tools: scales/tapes, dividers/trammels, scribes, punches, scribing blocks, squares, protractor, depth/internal/external micrometres, callipers (vernier, inside and outside, depth), gauges (height Vernier, feeler, bore/hole, slip, radius/profile, thread, plug), stick micrometres, dial stand and comparator, vee block with u-clamp)	1	3	-	-
PC16. mark out templates for tracing/transferring the specified features on the workpieces as per job specification	1	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC17. trace/transfer the specified features from the templates onto the workpieces as per job specification	1	3	-	-
<i>Perform fitting operations</i>	14	36	-	-
PC18. perform fitting operations on various forms of metal components using a range of hand tools and manually operated machines (Forms of metal components: square/rectangular (e.g. bar stock, sheet material, machined components); circular/cylindrical (e.g. bar stock, tubes, turned components, flat discs); sections (e.g. angles, channel, tee section, joists, extrusions); irregular shapes/profile (e.g. castings, forgings, odd shaped components) Fitting operations: filing, drilling, chiselling, threading(external, internal), hand tapping, scraping, manual lapping Hand tools: hammers; punches; screwdrivers; sockets; wrenches; spanners; scraper; chisels; gouges; files; taps; vices and clamps Manually operated machine tools: drills (power drills, pedestal drills),punching machines, threading machines)	2	3	-	-
PC19. follow the specified fitting sequence and procedure as per job specifications	1	3	-	-
PC20. interpret in-built fault indicators and error codes of equipment and respond to the same as per operating manual/organizational guidelines	2	3	-	-
PC21. check the fitted products to ensure completeness of work	2	3	-	-
PC22. check the quality of the output as per required standards, using visual checks and measurement of dimensional parameters (Dimensional parameters: linear dimensions; flatness; squareness; depths; angles; profiles; hole position; hole size/fit; thread size and fit)	2	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC23. produce components with various features as per standards applicable to the process (Features: 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; counter bore, countersink, or spot face; chamfers; reamed holes; faces which are square to each other; faces which are parallel to each other)	2	3	-	-
PC24. work to achieve production targets	-	3	-	-
PC25. report conditions and seek appropriate assistance in a timely manner to address risk of failure to comply with necessary targets and specifications	1	3	-	-
PC26. deal with finished components as per organizational guidelines	1	3	-	-
PC27. complete documentation during and post operations as per organizational procedures (Documentation: job card, progress records, incident reports)	1	3	-	-
PC28. return all tools and equipment to the correct location on completion of the fitting activities	-	3	-	-
PC29. leave the work area in a safe and tidy condition on completion of job activities	-	3	-	-
NOS Total	24	76	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0308
NOS Name	Perform fitting operations on metal components for making tools and dies using hand tools and manually operated machines
Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Fitting and Assembly
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	31/03/2022
NSQC Clearance Date	19/05/2015

CSC/N0309: 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. On completion of the fitting and fabrication operations on the metal components, the candidate will be expected to check the quality of the workpieces.

Scope

This unit/task covers the following:

- Work safely
- Check dimensions of the components of tool or die
- Prepare for assembling operations
- Perform assembling operations
- Measure and checking component

Elements and Performance Criteria

Work safely

To be competent, the user/individual on the job must be able to:

- 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

Check dimensions of the components of tool or die

To be competent, the user/individual on the job must be able to:

- PC6.** select measuring instruments based on tolerances required and application such as internal and external measurements
- PC7.** take measurements using standard and specialized measuring instruments
- PC8.** compare measurements to drawings and sketches to ensure conformity, fits and clearances
- PC9.** record critical dimensions as required by workplace procedures

Prepare for assembling operations

To be competent, the user/individual on the job must be able to:

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- PC10.** read and establish job requirements from the job specification document accurately (Job requirements: raw materials or components required (type, quality, quantity); dimensions; limits and tolerances; surface texture requirements; operations required (list, sequence and procedures where applicable); shape or profiles to be fabricated; cutting, bending and rolling allowances for fabricated forms; instruments and tools to be used; interdependencies; timelines Job specification documents: detailed component drawings; approved sketches/illustrations; national, international and organisational standards; reference tables and charts; fabrication/casting drawings; operational diagrams; contractual specifications)
- PC11.** obtain job specification from a valid and approved source (Valid sources: job instruction sheet/job card; work drawings and instructions; planning documentation; quality control documents; operation sheets; process specifications; instructions from supervisor)
- 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 and parts used in producing assemblies (Parts: 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 Heavy equipment: rollers and skates, crowbars, pull-lifts, lubricated plates Assembling accessories: hooks, slings, eyebolts, shackles, chains, rings, special-to purpose equipment, rules for the use of slings, trolleys Machine tools: lathes (centre, turret), milling machines (horizontal, vertical, universal), drilling machines (bench, pedestal, radial arm, multi-spindle, coordinate 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 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, recirculatory, splash, grease guns and nipples); reasons for oil deterioration (excessive heat, oxidation, contamination, breakdown of structure, poor storage conditions))
- 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*
- To be competent, the user/individual on the job must be able to:
- PC16.** drill, tap and ream locating holes as required to permanently locate components
- PC17.** fasten components permanently using methods such as using engineered fasteners, applying adhesives, soldering and brazing
- PC18.** appropriate methods and techniques to assemble and secure the components in their correct positions (Mechanical fastenings and joining techniques: non-permanent - nuts, bolts, studs, screws, pins, springs, keys, bearings; permanent - welded, soldered, brazed, riveted)
- PC19.** produce mechanical assemblies using various methods as per job specifications (Methods: assembling components having interference fits (e.g. by pressure, expansion or contraction); securing components using threaded fasteners (e.g. nuts, bolts, machine screws, cap screws); securing components using spring clips (e.g. external circlips, internal circlips, special clips); using locking and retaining devices (e.g. tab washers, locking nuts, wire locks, special purpose types); securing components using rivets (e.g. countersunk, roundhead, blind, special purpose types); applying sealing compounds or adhesives; electrical bonding of components; setting packing); torque setting of nuts and bolts)

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- PC20.** use various types of methods to dismantle mechanical assemblies without damage to components and/or subassemblies (Methods: 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)
- PC21.** 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
- PC22.** leave the work area in a safe and tidy condition on completion of the manufacturing activities
- PC23.** return all tools and equipment to the correct location on completion of the fitting activities (Various fitting activities: 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)
- PC24.** support the customer remotely over the internet to test potential solutions

Measure and checking component

To be competent, the user/individual on the job must be able to:

- PC25.** perform the necessary checks for dimensional parameters and functioning of the tool and die (Dimensional parameters: linear dimensions (e.g. lengths, depths); diameters (e.g. external, internal); flatness; squareness; angles; profiles; hole size and position; thread size and fit; surface finish)
- PC26.** use the appropriate measuring equipment for checking activities (Measuring equipments: external micrometres, vernier/digital/dial calliper, surface finish equipment (e.g. comparison plates, machines), rules, squares, protractors, depth micrometres, 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)
- PC27.** produce components within all of the applying quality standards (Quality standards: components to be free from false tool cuts, burrs and sharp edges; dimensional tolerance $\pm 0.020\text{mm}$; flatness and squareness 0.05mm ; angles within ± 1 degree; screw threads to fit as per standard; reamed and bored holes within interference: $- 0.025\text{mm}$ (hole) $+ 0.025\text{mm}$ (shaft), transition: $- 0.1\text{mm}$ (hole) $+ 0.1$ (shaft) , clearance: 50microns ; radius: 0.5 r; surface finish 1.6 m)

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, and procedures followed in the company
- KU2.** legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
- KU3.** relevant health and safety requirements applicable in the work place
- KU4.** importance of working in clean and safe environment
- KU5.** own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU6.** reporting structure, inter-dependent functions, lines and procedures in the work area
- KU7.** relevant people and their responsibilities within the work area

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- KU8.** escalation matrix and procedures for reporting work and employment related issues
- KU9.** documentation and related procedures applicable in the context of employment and work
- KU10.** importance and purpose of documentation in context of employment and work
- KU11.** hazards associated with carrying out the operations and how can they be minimized (Hazards: 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)
- KU12.** how to extract and use information from engineering drawings and related specifications in relation to work undertaken
- KU13.** how to interpret first and third angle drawings
- KU14.** the British and metric systems of measurement
- KU15.** geometric dimensioning and tolerancing -- GD&T
- KU16.** methods of holding the workpiece assembly activities
- KU17.** how to mount workpiece
- KU18.** various assembly methods, techniques and procedures to be used (Hand fitting methods: cutting out the rough profile using saws (e.g. hacksaw, bandsaw), cutting a screw thread (e.g. tapping or dieing), filing (flat, square, curved), drilling holes, tapping)
- KU19.** how the components are to be aligned, adjusted and positioned prior to securing them, and the tools and equipment (Alignment: slide ways: 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 slide ways 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)
- KU20.** various mechanical fastening devices that are used
- KU21.** how to mount and secure the cutting tools in the tool holding devices (Cutting tools: front or rear tools posts; mounting cutters on long or stub arbors; mounting drills in chucks or by the use of morse taper sockets)re the cutting tools in the tool holding devices); (Workholding tools: in a bench vice; machine vice; chuck; collets or clamped directly to the machine table)
- KU22.** the need to ensure that the tool is sharp and secure
- KU23.** types of production tools such as jigs, fixtures, dies, cutting tools and moulds
- KU24.** specifications for standard assembly fits and clearances
- KU25.** various features to be marked out (Features: datum lines; cutting guidelines; square and rectangular profiles; circular and radial profiles; angles; holes linearly positioned, boxed and on pitch circles)
- KU26.** the factors that affect the selection of cutting feeds and speeds, and the depth of cut (Factors: type of material, size of material, operations being performed, workholding method/security of workpiece, condition of machine, finish required, tolerance required)
- KU27.** types of fasteners such as screws and dowels
- KU28.** types of adhesives such as temporary and permanent
- KU29.** types of solder such as hard and soft

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- KU30.** types of fits such as interference and running clearance
- KU31.** types of joints such as lap and dovetail
- KU32.** types of dies such as cutting, forming, progressive and compound
- KU33.** types of workholding devices such as drill jig, weld jig and assembly fixture (Workholding devices: bench / machine vice; clamps (e.g. toolmakers); three-jaw chuck; four-jaw chuck; collet chuck; drive plate and centres; magnetic chucks(holding devices); special purpose tool holders (3R for holding electrodes))
- KU34.** clearancesetting practices such as inserting material between working faces and using light source
- KU35.** range of material and their properties such as composition and thickness (Range of Materials: Ferrous metals: e.g. carbon steels, stainless steels, cast iron, tool steel, hard metals; Non-ferrous metals: e.g. bronze, bronze alloys, copper and copper alloys; Non-metallic: e.g. hard and soft woods, composites, plastics: thermoplastic, thermosetting Properties: plasticity, elasticity, ductility, malleability, toughness, hardness, tensile strength, compressive strength, shear strength, corrosion resistance, density)
- KU36.** types of compression aids such as springs, compressed gas cylinders and urethane
- KU37.** types of noncompression devices such as punch retainers, pilots, punches and buttons
- KU38.** preloads on die springs, compressed gas cylinders and urethane strippers
- KU39.** optimal sequence of operations for assembly
- KU40.** techniques of taking trial cuts and checking dimensional parameters; the application of roughing and finishing cuts, and the effect on tool life, surface finish and dimensional parameters (Dimensional parameters: linear dimensions (e.g. lengths, depths); diameters (e.g. external, internal); flatness; squareness; angles; profiles; hole size and position; thread size and fit; surface finish)
- KU41.** how to check the workpiece and the measuring equipment that is used
- KU42.** need to check that the measuring equipment is within current calibration dates, and that the instruments are correctly zeroed
- KU43.** measuring internal and external dimensions
- KU44.** measuring geometric features
- KU45.** how to check surface finish
- KU46.** the importance of leaving the work area and equipment in a safe and clean condition on completion of the machining and fitting activities

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language
- GS2.** fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
- GS3.** undertake numerical operations, and calculations/ formulae (Numerical computations: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)

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- GS4.** identify and draw various basic, compound and solid shapes as per dimensions given (Basic shapes: square, rectangle, triangle, circle Compound shapes: involving squares, rectangles, triangles, circles, semicircles, quadrants of a circle Solid shapes: cube, rectangular prism, cylinder)
- GS5.** use appropriate measuring techniques and units of measurement
- GS6.** use appropriate units and number systems to express degree of accuracy (Units and number systems representing degree of accuracy: decimals places, significant figures, fractions as a decimal quantity)
- GS7.** use metric systems of measurement
- GS8.** convey and share technical information clearly using appropriate language
- GS9.** check and clarify task-related information
- GS10.** liaise with appropriate authorities using correct protocol
- GS11.** communicate with people in respectful form and manner in line with organizational protocol
- GS12.** plan, prioritize and sequence work operations as per job requirements
- GS13.** organize and analyse information relevant to work
- GS14.** basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS15.** exercise restraint while expressing dissent and during conflict situations
- GS16.** avoid and manage distractions to be disciplined at work
- GS17.** manage own time for achieving better results
- GS18.** work in a team in order to achieve better results
- GS19.** identify and clarify work roles within a team
- GS20.** communicate and cooperate with others in the team for better results
- GS21.** seek assistance from fellow team members
- GS22.** identify problems with work planning, procedures, output and behaviour and their implications
- GS23.** prioritize and plan for problem solving
- GS24.** communicate problems appropriately to others
- GS25.** identify sources of information and support for problem solving
- GS26.** seek assistance and support from other sources to solve problems
- GS27.** identify effective resolution techniques
- GS28.** select and apply resolution techniques
- GS29.** seek evidence for problem resolution
- GS30.** undertake and express new ideas and initiatives to others
- GS31.** modify work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS32.** participate in improvement procedures including process, quality and internal/external customer/supplier relationships
- GS33.** enhance ones competencies in new and different situations and contexts to achieve more
- GS34.** participate in on-the-job and other learning, training and development interventions and assessment
- GS35.** clarify task related information with appropriate personnel or technical adviser



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- GS36.** seek to improve and modify own work practices
- GS37.** maintain current knowledge of applicable standards, legislation, codes of practice and product/process developments

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work safely</i>	5	14	-	-
PC1. work safely at all times, complying with health and safety, environmental and other relevant regulations and guidelines	2	3	-	-
PC2. check that all safety mechanisms are in place and that the equipment is set correctly for the required operations	-	3	-	-
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	2	3	-	-
PC4. wear the appropriate protective clothing and equipment, and keep the work area clean and tidy	-	3	-	-
PC5. follow safe practice/approved setting up procedures at all times	1	2	-	-
<i>Check dimensions of the components of tool or die</i>	3	11	-	-
PC6. select measuring instruments based on tolerances required and application such as internal and external measurements	1	2	-	-
PC7. take measurements using standard and specialized measuring instruments	1	3	-	-
PC8. compare measurements to drawings and sketches to ensure conformity, fits and clearances	1	3	-	-
PC9. record critical dimensions as required by workplace procedures	-	3	-	-
<i>Prepare for assembling operations</i>	7	17	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. read and establish job requirements from the job specification document accurately (Job requirements: raw materials or components required (type, quality, quantity); dimensions; limits and tolerances; surface texture requirements; operations required (list, sequence and procedures where applicable); shape or profiles to be fabricated; cutting, bending and rolling allowances for fabricated forms; instruments and tools to be used; interdependencies; timelines Job specification documents: detailed component drawings; approved sketches/illustrations; national, international and organisational standards; reference tables and charts; fabrication/casting drawings; operational diagrams; contractual specifications)	2	2	-	-
PC11. obtain job specification from a valid and approved source (Valid sources: job instruction sheet/job card; work drawings and instructions; planning documentation; quality control documents; operation sheets; process specifications; instructions from supervisor)	1	3	-	-
PC12. establish the procedures to complete the general machining, fitting or assembling operations	1	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<p>PC13. obtain the appropriate tools and equipment for the general machining, fitting or assembling operation and parts used in producing assemblies (Parts: 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 Heavy equipment: rollers and skates, crowbars, pull-lifts, lubricated plates Assembling accessories: hooks, slings, eyebolts, shackles, chains, rings, special-to purpose equipment, rules for the use of slings, trolleys Machine tools: lathes (centre, turret), milling machines (horizontal, vertical, universal), drilling machines (bench, pedestal, radial arm, multi-spindle, coordinate 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 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, recirculatory, splash, grease guns and nipples); reasons for oil deterioration (excessive heat, oxidation, contamination, breakdown of structure, poor storage conditions))</p>	1	3	-	-
<p>PC14. check that all measuring equipment is within calibration date</p>	-	3	-	-
<p>PC15. fasten or clamp production tool components temporarily as required for final assembly</p>	2	3	-	-
<p><i>Perform assembling operations</i></p>	9	24	-	-
<p>PC16. drill, tap and ream locating holes as required to permanently locate components</p>	2	3	-	-
<p>PC17. fasten components permanently using methods such as using engineered fasteners, applying adhesives, soldering and brazing</p>	2	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC18. appropriate methods and techniques to assemble and secure the components in their correct positions (Mechanical fastenings and joining techniques: non-permanent - nuts, bolts, studs, screws, pins, springs, keys, bearings; permanent - welded, soldered, brazed, riveted)	2	3	-	-
PC19. produce mechanical assemblies using various methods as per job specifications (Methods: assembling components having interference fits (e.g. by pressure, expansion or contraction); securing components using threaded fasteners (e.g. nuts, bolts, machine screws, cap screws); securing components using spring clips (e.g. external circlips, internal circlips, special clips); using locking and retaining devices (e.g. tab washers, locking nuts, wire locks, special purpose types); securing components using rivets (e.g. countersunk, roundhead, blind, special purpose types); applying sealing compounds or adhesives; electrical bonding of components; setting packing); torque setting of nuts and bolts)	2	3	-	-
PC20. use various types of methods to dismantle mechanical assemblies without damage to components and/or subassemblies (Methods: 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)	1	3	-	-
PC21. 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	-	3	-	-
PC22. leave the work area in a safe and tidy condition on completion of the manufacturing activities	-	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC23. return all tools and equipment to the correct location on completion of the fitting activities (Various fitting activities: 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)	-	2	-	-
PC24. support the customer remotely over the internet to test potential solutions	-	2	-	-
<i>Measure and checking component</i>	2	8	-	-
PC25. perform the necessary checks for dimensional parameters and functioning of the tool and die (Dimensional parameters: linear dimensions (e.g. lengths, depths); diameters (e.g. external, internal); flatness; squareness; angles; profiles; hole size and position; thread size and fit; surface finish)	1	3	-	-
PC26. use the appropriate measuring equipment for checking activities (Measuring equipments: external micrometres, vernier/digital/dial calliper, surface finish equipment (e.g. comparison plates, machines), rules, squares, protractors, depth micrometres, 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)	1	2	-	-
PC27. produce components within all of the applying quality standards (Quality standards: 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 1.6 m)	-	3	-	-
NOS Total	26	74	-	-



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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0309
NOS Name	Perform assembly operations on metal components to make tools and dies
Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Fitting and Assembly
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	31/03/2022
NSQC Clearance Date	19/05/2015

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CSC/N1335: Use basic health and safety practices at the workplace

Description

This OS unit is about knowledge and practices relating to health, safety and security that candidates need to use in the workplace. It covers responsibilities towards self, others, assets and the environment.

Scope

This unit/task covers the following:

- Health and safety
- Fire safety
- Emergencies, rescue and first-aid procedure

Elements and Performance Criteria

Health and safety

To be competent, the user/individual on the job must be able to:

- PC1.** use protective clothing/equipment for specific tasks and work conditions (Protective clothing: leather or asbestos gloves, flame proof aprons, flame proof overalls buttoned to neck, cuffless (without folds), trousers, reinforced footwear, helmets/hard hats, cap and shoulder covers, ear defenders/plugs, safety boots, knee pads, particle masks, glasses/goggles/visors
Equipment: hand shields, machine guards, residual current devices, shields, dust sheets, respirator)
- PC2.** state the name and location of people responsible for health and safety in the workplace
- PC3.** state the names and location of documents that refer to health and safety in the workplace
- PC4.** identify job-site hazardous work and state possible causes of risk or accident in the workplace (Hazards: sharp edged and heavy tools; heated metals; oxyfuel and gas cylinders; welding radiation; hazardous surfaces(sharp, slippery, uneven, chipped, broken, etc.); hazardous substances(chemicals, gas, oxy-fuel, fumes, dust, etc.); physical hazards(working at heights, large and heavy objects and machines, sharp and piercing objects, tolls and machines, intense light, load noise, obstructions in corridors, by doors, blind turns, noise, over stacked shelves and packages, etc.) electrical hazards (power supply and points, loose and naked cables and wires, electrical machines and appliances, etc.) Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness))
- PC5.** carry out safe working practices while dealing with hazards to ensure the safety of self and others (Safe working practices: using protective clothing and equipment; putting up and reading safety signs; handle tools in the correct manner and store and maintain them properly; keep work area clear of clutter, spillage and unsafe object lying casually; while working with electricity take all electrical precautions like insulated clothing, adequate equipment insulation, use of control equipment, dry work area, switch off the power supply when not required, etc.; safe lifting and carrying practices; use equipment that is working properly and is well maintained; take due measures for safety while working in confined places, trenches or at heights, etc. including safety harness, fall arrestors, etc.)

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- PC6.** state methods of accident prevention in the work environment of the job role (Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors)
- PC7.** state location of general health and safety equipment in the workplace (General health and safety equipment: fire extinguishers; first aid equipment; safety instruments and clothing; safety installations(eg fire exits, exhaust fans))
- PC8.** inspect for faults, set up and safely use steps and ladders in general use (Ladder faults: corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/ unfixed nuts or bolts, etc.) (Ladders set up: firm/level base, clip/lash down, leaning at the correct angle, etc.)
- PC9.** work safely in and around trenches, elevated places and confined areas
- PC10.** lift heavy objects safely using correct procedures
- PC11.** apply good housekeeping practices at all times (Good housekeeping practices: clean/tidy work areas, removal/disposal of waste products, protect surfaces)
- PC12.** identify common hazard signs displayed in various areas (Various areas: on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc.)
- PC13.** retrieve and/or point out documents that refer to health and safety in the workplace (Documents: fire notices, accident reports, safety instructions for equipment and procedures, company notices and documents, legal documents (eg government notices))

Fire safety

To be competent, the user/individual on the job must be able to:

- PC14.** use the various appropriate fire extinguishers on different types of fires correctly (Types of fires: Class A: eg. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: eg. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no longer receiving electricity); Class D: combustible metals such as magnesium, titanium, and sodium (These fires burn at extremely high temperatures and require special suppression agents))
- PC15.** demonstrate rescue techniques applied during fire hazard
- PC16.** demonstrate good housekeeping in order to prevent fire hazards
- PC17.** demonstrate the correct use of a fire extinguisher

Emergencies, rescue and first-aid procedures

To be competent, the user/individual on the job must be able to:

- PC18.** demonstrate how to free a person from electrocution
- PC19.** administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.
- PC20.** demonstrate basic techniques of bandaging
- PC21.** respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments
- PC22.** perform and organize loss minimization or rescue activity during an accident in real or simulated environments
- PC23.** administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases

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- PC24.** demonstrate the artificial respiration and the CPR Process
- PC25.** participate in emergency procedures (Emergency procedures: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call, correct return to work)
- PC26.** complete a written accident/incident report or dictate a report to another person, and send report to person responsible (Incident Report includes details of: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified)

Emergencies, rescue and first-aid procedures

To be competent, the user/individual on the job must be able to:

- PC27.** demonstrate correct method to move injured people and others during an emergency

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** names (and job titles if applicable), and where to find, all the people responsible for health and safety in a workplace
- KU2.** names and location of documents that refer to health and safety in the workplace
- KU3.** meaning of hazards and risks
- KU4.** health and safety hazards commonly present in the work environment and related precautions
- KU5.** possible causes of risk, hazard or accident in the workplace and why risk and/or accidents are possible
- KU6.** possible causes of risk and accident (Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness))
- KU7.** methods of accident prevention (Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors)
- KU8.** safe working practices when working with tools and machines
- KU9.** safe working practices while working at various hazardous sites
- KU10.** where to find all the general health and safety equipment in the workplace
- KU11.** various dangers associated with the use of electrical equipment
- KU12.** preventative and remedial actions to be taken in the case of exposure to toxic materials (Exposure: ingested, contact with skin, inhaled); (Preventative action: ventilation, masks, protective clothing/ equipment); (Remedial action: immediate first aid, report to supervisor Toxic materials: solvents, flux, lead)
- KU13.** importance of using protective clothing/equipment while working
- KU14.** precautionary activities to prevent the fire accident
- KU15.** various causes of fire (Causes of fires: heating of metal; spontaneous ignition; sparking; electrical heating; loose fires (smoking, welding, etc.); chemical fires; etc.)
- KU16.** techniques of using the different fire extinguishers
- KU17.** different methods of extinguishing fire

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- KU18.** different materials used for extinguishing fire (Materials: sand, water, foam, CO₂, dry powder)
- KU19.** rescue techniques applied during a fire hazard
- KU20.** various types of safety signs and what they mean
- KU21.** appropriate basic first aid treatment relevant to the condition eg. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries
- KU22.** content of written accident report
- KU23.** potential injuries and ill health associated with incorrect manual handling
- KU24.** safe lifting and carrying practices
- KU25.** personal safety, health and dignity issues relating to the movement of a person by others
- KU26.** potential impact to a person who is moved incorrectly

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read and comprehend basic content to read labels, charts, signages
- GS2.** read and comprehend basic English to read manuals of operations
- GS3.** read an accident/incident report in local language or English
- GS4.** write an accident/incident report in local language or English
- GS5.** question co-workers appropriately in order to clarify instructions and other issues
- GS6.** give clear instructions to coworkers, subordinates others
- GS7.** 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
- GS8.** plan and organize their own work schedule, work area, tools, equipment and materials to maintain decorum and for improved productivity
- GS9.** remain congenial while discussing and debating issues with co-workers
- GS10.** follow appropriate protocols for communication based on situation, hierarchy, organizational culture and practice
- GS11.** ask for, provide and receive required assistance where possible to ensure achievement of work related objectives
- GS12.** thank co-workers for any assistance received
- GS13.** offer appropriate respect based on mutuality and respect for fellow workmanship and authority
- GS14.** identify immediate or temporary solutions to resolve delays
- GS15.** identify sources of support that can be availed of for problem solving for various kind of problems
- GS16.** seek appropriate assistance from other sources to resolve problems
- GS17.** report problems that you cannot resolve to appropriate authority
- GS18.** identify cause and effect relations in their area of work
- GS19.** use cause and effect relations to anticipate potential problems and their solution

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Health and safety</i>	21	32	-	-
PC1. use protective clothing/equipment for specific tasks and work conditions (Protective clothing: leather or asbestos gloves, flame proof aprons, flame proof overalls buttoned to neck, cuffless (without folds), trousers, reinforced footwear, helmets/hard hats, cap and shoulder covers, ear defenders/plugs, safety boots, knee pads, particle masks, glasses/goggles/visors Equipment: hand shields, machine guards, residual current devices, shields, dust sheets, respirator)	1	3	-	-
PC2. state the name and location of people responsible for health and safety in the workplace	1	2	-	-
PC3. state the names and location of documents that refer to health and safety in the workplace	1	2	-	-
PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace (Hazards: sharp edged and heavy tools; heated metals; oxyfuel and gas cylinders; welding radiation; hazardous surfaces(sharp, slippery, uneven, chipped, broken, etc.); hazardous substances(chemicals, gas, oxy-fuel, fumes, dust, etc.); physical hazards(working at heights, large and heavy objects and machines, sharp and piercing objects, tolls and machines, intense light, load noise, obstructions in corridors, by doors, blind turns, noise, over stacked shelves and packages, etc.) electrical hazards (power supply and points, loose and naked cables and wires, electrical machines and appliances, etc.) Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness))	2	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC5. carry out safe working practices while dealing with hazards to ensure the safety of self and others (Safe working practices: using protective clothing and equipment; putting up and reading safety signs; handle tools in the correct manner and store and maintain them properly; keep work area clear of clutter, spillage and unsafe object lying casually; while working with electricity take all electrical precautions like insulated clothing, adequate equipment insulation, use of control equipment, dry work area, switch off the power supply when not required, etc.; safe lifting and carrying practices; use equipment that is working properly and is well maintained; take due measures for safety while working in confined places, trenches or at heights, etc. including safety harness, fall arrestors, etc.)	2	2	-	-
PC6. state methods of accident prevention in the work environment of the job role (Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors)	2	1	-	-
PC7. state location of general health and safety equipment in the workplace (General health and safety equipment: fire extinguishers; first aid equipment; safety instruments and clothing; safety installations(eg fire exits, exhaust fans))	2	3	-	-
PC8. inspect for faults, set up and safely use steps and ladders in general use (Ladder faults: corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/unfixed nuts or bolts, etc.) (Ladders set up: firm/level base, clip/lash down, leaning at the correct angle, etc.)	2	3	-	-
PC9. work safely in and around trenches, elevated places and confined areas	2	3	-	-
PC10. lift heavy objects safely using correct procedures	2	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. apply good housekeeping practices at all times (Good housekeeping practices: clean/tidy work areas, removal/disposal of waste products, protect surfaces)	2	3	-	-
PC12. identify common hazard signs displayed in various areas (Various areas: on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc.)	1	2	-	-
PC13. retrieve and/or point out documents that refer to health and safety in the workplace (Documents: fire notices, accident reports, safety instructions for equipment and procedures, company notices and documents, legal documents (eg government notices))	1	3	-	-
<i>Fire safety</i>	4	10	-	-
PC14. use the various appropriate fire extinguishers on different types of fires correctly (Types of fires: Class A: eg. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: eg. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no longer receiving electricity); Class D: combustible metals such as magnesium, titanium, and sodium (These fires burn at extremely high temperatures and require special suppression agents))	1	2	-	-
PC15. demonstrate rescue techniques applied during fire hazard	1	2	-	-
PC16. demonstrate good housekeeping in order to prevent fire hazards	1	3	-	-
PC17. demonstrate the correct use of a fire extinguisher	1	3	-	-
<i>Emergencies, rescue and first-aid procedures</i>	9	20	-	-
PC18. demonstrate how to free a person from electrocution	1	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC19. administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.	1	2	-	-
PC20. demonstrate basic techniques of bandaging	1	2	-	-
PC21. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments	1	2	-	-
PC22. perform and organize loss minimization or rescue activity during an accident in real or simulated environments	1	2	-	-
PC23. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases	1	2	-	-
PC24. demonstrate the artificial respiration and the CPR Process	1	2	-	-
PC25. participate in emergency procedures (Emergency procedures: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call, correct return to work)	1	3	-	-
PC26. complete a written accident/incident report or dictate a report to another person, and send report to person responsible (Incident Report includes details of: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified)	1	2	-	-
<i>Emergencies, rescue and first-aid procedures</i>	2	2	-	-
PC27. demonstrate correct method to move injured people and others during an emergency	2	2	-	-
NOS Total	36	64	-	-

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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N1335
NOS Name	Use basic health and safety practices at the workplace
Sector	Capital Goods
Sub-Sector	Machine Tools, Process Plant Machinery, Dies, Moulds and Press Tools, Electrical and Power Machinery, Plastics Manufacturing Machinery, Light Engineering Goods, Textile Manufacturing Machinery
Occupation	Machining
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	19/06/2022
NSQC Clearance Date	22/04/2015

CSC/N1336: 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 etc.

Elements and Performance Criteria

Work effectively with others

To be competent, the user/individual on the job must be able to:

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

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
- KU2.** reporting structure, inter-dependent functions, lines and procedures in the work area
- KU3.** relevant people and their responsibilities within the work area
- KU4.** escalation matrix and procedures for reporting work and employment related issues
- KU5.** various categories of people that one is required to communicate and coordinate within the organization
- KU6.** importance of effective communication in the workplace

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- KU7.** importance of teamwork in organizational and individual success
- KU8.** various components of effective communication
- KU9.** key elements of active listening
- KU10.** value and importance of active listening and assertive communication
- KU11.** barriers to effective communication
- KU12.** importance of tone and pitch in effective communication
- KU13.** importance of avoiding casual expletives and unpleasant terms while communicating professional circles
- KU14.** how poor communication practices can disturb people, environment and cause problems for the employee, the employer and the customer
- KU15.** importance of ethics for professional success
- KU16.** importance of discipline for professional success
- KU17.** what constitutes disciplined behavior for a working professional
- KU18.** common reasons for interpersonal conflict
- KU19.** importance of developing effective working relationships for professional success
- KU20.** expressing and addressing grievances appropriately and effectively
- KU21.** importance and ways of managing interpersonal conflict effectively

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read basic terms and terminologies to accurately interpret work-related documents, labels, supervisor instructions in the local language
- GS2.** read and interpret accurate information from various relevant work instructions and records
- GS3.** write clear and legible notes to self, colleagues and seniors to pass messages, keep records, prepare to-do lists, take down instructions
- GS4.** write basic numbers, quantities and work-related terminology for operational requirements in the local language
- GS5.** interact with the supervisor appropriately (correct protocol and manner of speaking) in order to understand the basic requirements of the product, production plans, and other associated requirements
- GS6.** give clear instructions to co-workers about the type of output required and answer queries
- GS7.** display active listening skills while interacting with co-workers and others in the workplace
- GS8.** use appropriate planning to maintain a smooth relationship with fellow team members
- GS9.** take steps within ones limits of authority to initiate modification in plan if the circumstances require it
- GS10.** check that work meets customer requirements
- GS11.** deliver consistent and reliable service to internal and external customers
- GS12.** work with co-workers and supervisor to resolve any issues that threaten disruption, increase risk, cause delays or under-achievement of quality and targets as per the planned schedule

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work effectively with others</i>	30	70	-	-
PC1. accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	3	7	-	-
PC2. accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt	3	7	-	-
PC3. give information to others clearly, at a pace and in a manner that helps them to understand	3	7	-	-
PC4. display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible	3	7	-	-
PC5. consult with and assist others to maximize effectiveness and efficiency in carrying out tasks	3	7	-	-
PC6. display appropriate communication etiquette while working (Communication etiquette: do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa) etc.)	3	7	-	-
PC7. display active listening skills while interacting with others at work	3	7	-	-
PC8. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism	3	7	-	-
PC9. demonstrate responsible and disciplined behaviors at the workplace (Disciplined behaviors: e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc.)	3	7	-	-
PC10. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict	3	7	-	-
NOS Total	30	70	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N1336
NOS Name	Work effectively with others
Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Machining
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	30/09/2021
Next Review Date	30/07/2024
NSQC Clearance Date	30/09/2021

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for the Qualification Pack will be created by CGSC.
2. Performance Criteria (PC) have been assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
3. The assessment for the theory part will/may be based on knowledge bank of questions approved CGSC.
4. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
5. Assessment Agencies will create Assessor Guides comprising of Theory and Practical Assessment Set and Guidelines for each examination/training centre (as per assessment criteria below). The same will be approved by CGSC for adequacy.
6. To successfully attain Certification on the Qualification Pack, the trainee must score a minimum of 70% in each Core NOS and minimum of 50% in all non-core NOS. In addition, a candidate needs to attain a minimum overall pass percentage of 70% for certification.

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7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 70

(Please note: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
CSC/N0108. Operate conventional milling machines	17	83	-	-	100	12
CSC/N0109. Operate grinding machines	21	79	-	-	100	5
CSC/N0110. Operate conventional turning machines	21	79	-	-	100	10
CSC/N0302. Grind surface using hand and hand-held power tools	23	77	-	-	100	10
CSC/N0307. Plan and co-ordinate the making of tools and die	30	70	-	-	100	14
CSC/N0308. Perform fitting operations on metal components for making tools and dies using hand tools and manually operated machines	24	76	-	-	100	14
CSC/N0309. Perform assembly operations on metal components to make tools and dies	26	74	-	-	100	15
CSC/N1335. Use basic health and safety practices at the workplace	36	64	-	-	100	10



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National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
CSC/N1336.Work effectively with others	30	70	-	-	100	10
Total	228	672	-	-	900	100

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
CNC	Computer Numerically Controlled
EDM	Electric Discharge Machine
VMC	Vertical Machining Centre
CMM	Co-Ordinate Measuring Machine
DTI	Dial Testing Indicators
GD&T	Geometric Dimensioning And Tolerancing
CO2	Carbon Dioxide
CPR	Cardiac Pulmonary Resuscitation
PPE	Personal Protective Equipment
ISO	International Organization For Standardization

Qualification Pack

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a 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 quality of performance required.

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Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.