



**The Manufacturers Association**

**JOB QUALIFICATION STANDARD (JQS)**

**Occupation:** MACHINIST (CNC)

**Work Process:** Foundations in Machining

**Practical Hours:** 2000 hrs.

**DOL Standard:** Health and Safety/PPE: Adhere to safety practices when performing tasks within the working environment.

**Performance Objective:** Demonstrate the ability to adhere to federal, state and company safety, health and environmental rules and regulations to avoid workplace injury for an individual and their co-workers.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to adhere to personal grooming requirements in the facility.	
Demonstrate the ability to use personal protective equipment including eye, ear, hand, respiratory, body and foot protection, by ensuring that a correct fit and optimum protection is provided to the wearer for the specific task, in accordance with applicable safety legislation, government regulations, manufacturers' specifications and company standards/procedures.	
Demonstrate the ability to practice good housekeeping in the workplace by cleaning up spills or leaks, keeping work area clean and clear of obstructions, and storing tools or equipment so that the potential for accident or injury is prevented and tools or equipment are in place and available in compliance with safety regulations.	
Demonstrate the safe use of hand and power tools.	
Demonstrate the correct way to clean machines and floor area.	
Demonstrate the ability to prevent back injuries by adhering to proper work practices when performing the lifting of objects.	
Demonstrate the ability to identify all pinch points on primary and supportive machine tools and the proper placements of guards as part of a pre-operational check of the equipment in compliance with company standards.	
Demonstrate both emergency and standard shut down of all required equipment.	
Demonstrate the ability to follow fire safety procedures including: determining the potential for fire posed by the work being performed; locating and assessing the severity of the fire; selecting and operating fire extinguishing equipment; suppressing minor fires; activating alarms; following fire evacuation plans; and, reporting incidents; in accordance with applicable Acts, Regulations, Legislation, and Codes, manufacturers' specifications, and company standards or procedures.	
Demonstrate the proper fuel source and select the corresponding fire extinguisher.	
Demonstrate the ability to identify the impact of climatic extremes of wind, temperature, or precipitation on job functions, to ensure personal safety and efficient job performance.	



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Demonstrate the ability to work around energy sources by observing limits and procedures for approaching energy sources to ensure personal safety and protection of equipment in accordance with standards.	
Demonstrate the ability to report injuries to a supervisor or safety personnel promptly, ensuring that the injured person is attended to and information is reported precisely and accurately describing how the incident occurred, so that future recurrence of similar accidents is prevented.	
Demonstrate the ability to prevent back injuries by adhering to proper work practices when performing the lifting of objects.	
Demonstrate the ability to perform good practices in workplace ergonomics to prevent injury while performing work over an extended period of time.	

**DOL Standard:** Lock-Out/Tag-Out: Observe safe practices, in accordance with OSHA and organizational requirements, when performing Lock-Out/Tag-Out duties on equipment.

**Performance Objective:** Demonstrate the ability to adhere to lock-out/tag-out procedures and energy isolation for assigned machinery in accordance with facility regulations.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to recognize all protective tags and lockout devices that are used to isolate equipment and components from hazardous energy sources.	
Demonstrate the ability to perform a lock out procedure to isolate energy on an identified piece of equipment located on the shop floor.	

**DOL Standard:** Handling Hazardous Materials: Observe safe practices, in accordance with OSHA, EPA and organizational requirements, when handling and storing hazardous materials at the workplace.

**Performance Objective:** Demonstrate the ability to comply with OSHA regulations regarding hazardous materials and SDS communication, handling and storage.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to handle and store hazardous materials as assigned, while adhering to safe practices in accordance with OSHA and EPA requirements and guidelines, including completing the required documentation.	
Demonstrate how to identify and recognize hazardous situations and apply proper procedures (includes following guidelines to prevent spread of blood borne pathogens and spill control).	



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Demonstrate the ability to prevent back injuries by adhering to proper work practices when performing the lifting of objects.	
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**DOL Standard:** Shop Practices: Apply a working knowledge of the expectations for an apprentice and the general shop practices required by the apprentice.

**Performance Objective:** Demonstrate the ability to display integrity by applying the apprentice’s work expectations as defined by the apprenticeship program.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to respect for company’s time and property.	
Demonstrate the ability to accept responsibility for one’s decision and actions.	
Demonstrate the ability to know the jobs assigned to you.	
Demonstrate a working knowledge of the company policy manual.	
Demonstrate an ability to show up on time every day with a desire to work hard and add value to the company.	
Demonstrate the ability to follow instructions laid out by your supervisor.	
Demonstrate a dedication to the trade and to the quality and professional standards set forth by the company.	
Demonstrate how to performing a preventive maintenance procedure for a given machine to extend machine life and minimize downtime in accordance with company-approved maintenance specifications and overall program goals.	

**Performance Objective:** Demonstrate the ability to display initiative by showing a willingness to work and seek out new work challenges.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to take initiatives in seeking out new responsibilities and work challenges, increasing the variety of scope of one’s job.	
Demonstrate the ability to pursue work with energy, drive and determination to accomplish one’s tasks.	
Demonstrate the ability to establish and maintain personally challenging, but realistic work goals.	
Demonstrate the ability to strive to exceed standards and expectations.	



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**Performance Objective:** Demonstrate the ability to display dependability and reliability by showing responsible behaviors at work.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to behave consistently, predictably and reliably.	
Demonstrate the ability to fulfill obligations, complete assignments and meet deadlines.	
Demonstrate the ability to follow written and verbal directions.	
Demonstrate the ability to comply with organizational rules, policies and procedures.	
Demonstrate the ability to comply with regular and punctual attendance.	

**Performance Objective:** Demonstrate the ability to display adaptability by showing the capability to adapt to new, different or changing requirements.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to be open to learning and considering new ways of doing things.	
Demonstrate the ability to actively seek out and carefully consider the merits of new approaches to work.	
Demonstrate the ability to embrace new approaches when appropriate and discard approaches that are no longer working.	
Demonstrate the ability to effectively change plans, goals, actions or priorities to deal with changing situations.	

**Performance Objective:** Demonstrate the ability to display business fundamentals in serving and protecting the organization and industry.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to understand one's role in the functioning of the company and the potential impact of one's performance can have on the success of the organization.	
Demonstrate the ability to recognize the importance of maintaining privacy and confidentiality of company information, as well as that of customers and co-workers, and comply with intellectual property laws.	



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**Performance Objective:** Demonstrate the ability to plan and prioritize work to manage time effectively and accomplish assigned tasks.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to plan and schedule tasks so that work is completed on time.	
Demonstrate the ability to prioritize various competing tasks.	
Demonstrate the ability to effectively allocate time and resources efficiently.	
Demonstrate the ability to take the necessary actions when project go off track.	

**Performance Objective:** Demonstrate the ability to actively look for ways to identify market demands and meet client needs.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to understand and anticipate customer need.	
Demonstrate the ability to provide personalized service with prompt and efficient responses to meet the requirements, requests and concern of clients.	
Demonstrate the ability to be pleasant, courteous and professional when dealing with internal and external clients.	
Demonstrate the ability to evaluate client satisfaction.	

**Performance Objective:** Demonstrate the ability to display teamwork by working and communicating effectively with others in a respectful manner.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to establish a high degree of trust and credibility with others.	
Demonstrate the ability to interact professionally and respectfully with supervisors and co-workers.	
Demonstrate the ability to develop constructive working relationships and maintain them over time.	
Demonstrate the ability to use appropriate strategies and solutions for dealing with conflicts and differences to maintain a smooth workflow.	



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**DOL Standard:** Machinist Calculations: Apply a working knowledge of calculating and solving mathematical problems when interpreting specifications and performing tasks within the manufacturing environment.

**Performance Objective:** Demonstrate the ability to use basic mathematics to solve problems.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to add, subtract, multiply and divide whole numbers, fractions, decimals and percentages.	
Demonstrate the ability to convert decimals to fractions and convert fractions to percentages.	
Demonstrate the ability to calculate averages, ratios, proportions and rates.	
Demonstrate the ability to take measurement of time, temperature, distance, length, width, height and weight and convert one measurement to another.	
Demonstrate the ability to translate practical problems into useful mathematical expressions.	

**DOL Standard:** Engineering Prints and Drawings: Apply a working knowledge of foundational drawing and print reading skills when interpreting specifications and performing tasks within the manufacturing environment.

**Performance Objective:** Demonstrate the ability to interpret information found on a blueprint and call out critical information regarding the drawing.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to identify symbols, notations, and lines to industry standards.	
Demonstrate the ability to determine dimensions, critical features and tolerances on machine drawing.	
Demonstrate the ability to interpret pictorial drawings to industry standards.	
Demonstrate the ability to interpret multi-view drawings to industry standard.	
Demonstrate the ability to locate part numbers and correlated those numbers to manufacturing and inspection tasks performed on the job.	

**Performance Objective:** Demonstrate the ability to apply math concepts to solve calculations on prints or drawings necessary for planning and setting up machining operations.

Performance Indicator	Qualification Date/Initial
Using a sample print, demonstrate how to calculate a missing angle from a triangle.	



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Using a sample print, demonstrate how to solve missing measurements in right angles.	
Using a sample print, demonstrate how to calculate the area of a circle.	
Using a sample print, demonstrate how to solve for the unknown hypotenuse of a right triangle using the Pythagorean Theorem.	
Demonstrate the ability to determine speeds and feeds calculations so that the required specifications and parameters are correctly determined to machine the workpiece in accordance with engineering drawings and job specifications.	
Demonstrate the ability to calculate cutting tool positions so that the required specifications and parameters are correctly determined to machine the workpiece in accordance with engineering drawings and job specifications.	
Demonstrate the ability to solve calculations to check workplace alignments and the dimensions to be measured and verified so that the required specifications and parameters are correctly determined to machine the workpiece in accordance with engineering drawings and job specifications.	
Demonstrate the ability to use the Machinist's Handbook to calculate cutting tool direct, simple and angular position and indexing so that the required specifications and parameters are correctly determined to machine the workpiece in accordance with engineering drawings and job specifications.	

**Performance Objective:** Demonstrate the ability to measure of part features using the application of Geometric Dimensioning and Tolerancing (GD&T) principals.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to identify symbols for showing datums and basic dimensions on drawings.	
Demonstrate the ability to identify symbols for Maximum Material Size (MMS) and Regardless of Feature Size (RFS).	



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**DOL Standard:** Measuring and Improving Work: Apply common systems for designing and measuring work processes and the commitment to continuous improvement through empowerment and management by people and data.

**Performance Objective:** Demonstrate the ability to conduct the process of collecting and comparing data trends using the company’s quality Statistical Process Control (SPC) software platform.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to perform statistical calculations to determine the mean, median, and mode for a set of data.	
Demonstrate the ability to record points on a control chart.	
Demonstrate the ability to identify a process that is in or out of control.	
Demonstrate the ability to work towards the mean during process.	
Demonstrate the ability to identify a production problem, propose a remedy, having been given the authorization to implement the process improvement and carry it out.	

**DOL Standard:** Problem Solving: Apply a working knowledge of analyzing information and evaluating results to choose the best solution and solve problems.

**Performance Objective:** Demonstrate the ability to use logical thought processes to analyze and draw conclusions.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to identify inconsistent or missing information.	
Demonstrate the ability to critically review, analyze, synthesize, compare and interpret information.	
Demonstrate the ability to draw conclusions from relevant and or missing information.	
Demonstrate the ability to test possible hypotheses to ensure the problem is correctly diagnosed and the best solution is found.	
Demonstrate the ability to distinguish between deviations and problems in processes or equipment.	





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**Performance Objective:** Demonstrate the ability to apply critical thinking skills to solve problems by generating, evaluating, and implementing solutions.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to identify early warning signs in processes or equipment.	
Demonstrate the ability to apply the “5 Why’s” technique through root cause analysis.	
Demonstrate the ability to document troubleshooting information.	

**Performance Objective:** Demonstrate the ability to use creative thinking tools by applying critical thinking and problem-solving methodologies to your own workplace situations.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to apply critical thinking techniques to identify and articulate problems.	
Demonstrate the ability to apply critical thinking techniques to develop and implement solutions.	
Demonstrate the ability to apply critical thinking techniques to identify obstacles and solve problems.	

**DOL Standard:** Manual Machining Fundamentals: Apply a working knowledge of metal removal theory, set up and operations, including the verification of components such as workholding devices, cutting tools and toolholders.

**Performance Objective:** Demonstrate the ability to identify common metal cutting process and major components used within those processes.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to identify a single-point and multi-point tooling process.	
Demonstrate the ability to identify a sawing process.	
Demonstrate the ability to identify a turning process.	
Demonstrate the ability to distinguish between inner and outer diameter cutting operations.	
Demonstrate the ability to identify a milling process.	
Demonstrate the ability to identify a holmaking process.	
Demonstrate the ability to identify a multiple cutting operation.	
Demonstrate the ability to identify a broaching process.	



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Demonstrate the ability to identify a drilling process.	
Demonstrate the ability to contrast a vertical and horizontal machine process.	
Demonstrate the ability to identify a boaring process.	

**Performance Objective:** Demonstrate the ability to set up, operate and tend to conventional machines and tools that remove metal, within a defined tolerance, to be used in further machining or fabrication processes.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to verify workpiece material for correct size and type by checking color codes, lettering, or numerical stamps to ensure that the workpiece selected conforms to engineering drawings and job instruction sheets.	
Demonstrate the correct identification and selection of cutting fluids using manuals, charts, engineering drawings, and material safety data sheets to ensure that the cutting fluid is the correct one to maximize machining without damage to workpiece, cutting tool, or machine.	
Demonstrate the ability to identify and select machines (conventional and numerically controlled) saws, drills, lathes, grinders, and vertical or horizontal mills, using information from engineering drawings and work process documentation, to ensure that the machine selected is the correct one for the application and available to perform the job.	
Demonstrate the ability to identify and check machine controls and systems including locating and identifying switches, buttons, levers, controls, and safety devices to ensure that all controls are operational and functioning in accordance with manufacturer's specifications and company standards.	
Demonstrate the ability to identify and select tooling required to cut the workpiece by using information, engineering drawings and job instructions, ensuring that the selected tooling is the correct size and type for the application and available to perform the job.	
Demonstrate the ability to identify and prepare cutting tools by sharpening or replacing tools so that the cutting shape and angle is prepared for optimum cutting and personal safety in accordance with manufacturer's specifications, engineering drawings, and company standards.	
Demonstrate the ability to identify and select measuring instruments, ensuring that instruments selected are capable of measuring the dimensions and tolerances specified in the engineering drawings, job specifications, and process layout.	
Demonstrate the ability to select machine speeds and feeds using speed and feed charts and in accordance with size, type, and hardness of workpiece materials, so that the machines perform optimum cutting without damage to workpiece, cutting tools, or machines and ensures personal safety.	
Demonstrate the ability to identify and select workholding devices including (not limited to) vises, clamps, jigs, chucks, face plates, centers, catch plates, steady rest, tailstocks, and	



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mandrels, ensuring that the workholding device selected is the correct one to safely and securely position and locate the workpiece in the machine in accordance with job specifications.	
Demonstrate the ability to communicate with co-workers concerning previous job operations, availability of tools, parts, and machinery, scheduling requirements, and any other information needed to plan and prepare for the machining job, ensuring that the information communicated is clear, concise, and accurate.	

**DOL Standard:** In-Process Verification: Apply a working knowledge of foundational measurement skills when interpreting specifications for in-process dimensional or surface verification.

**Performance Objective:** Demonstrate the ability to interpret part drawing specifications (dimensions, layout, material, surface finish, countersinks, tolerances, threading, etc.) and then select and use the gauges to measure features or characteristics, the applicable tolerance and the accuracy, and the resolution and capability of the test instrument.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to check straight cuts by using precision measuring instruments including (not limited to) micrometer, verniers, calipers, squares, straight edge, dial indicator, and surface comparator, to ensure that the accurate size, finish, parallelism and squareness of straight cuts conform with engineering drawings and job specifications.	
Demonstrate the ability to check shapes by using precision measuring instruments and checking devices including radius gauges, surface comparator and verniers, to ensure that the profile and finish of the cut shape conform to engineering drawing and job specifications.	
Demonstrate the ability to check threads by using precision measuring instruments, checking devices, and various checking methods including 3-wire method, thread micrometer, thread gauge, and plug or ring gauges, to ensure that the accuracy of pitch, thread geometry and size of cut threads conform to engineering drawings and job specifications.	
Demonstrate the ability to check holes by using precision measuring instruments and checking devices including (not limited to) dial indicators, bore gauges, plug gauges, telescopic gauges, surface comparators, and verniers to ensure that the accuracy of the diameter, depth, concentricity, position, and finish of cut holes conform to engineering drawings and job specifications.	
Demonstrate the ability to check tapers using precision measuring instruments and checking devices including taper gauge, sine bar, micrometer, and vernier to ensure that the accuracy of the angle, taper/foot, and diameter of the cut tapers conform to engineering drawings and job specifications.	



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Demonstrate the ability to check hardness using various types of hardness testers and comparison charts to ensure that the hardness level of the workpiece materials conform to engineering drawings and job specifications.	
Demonstrate the ability to maintain material identification by marking or stamping workpiece and completing shop documentation to facilitate traceability of the final product or work-in-process and to maintain inventory control in accordance with company standards.	
Demonstrate the ability to check surfaces using surface comparators to ensure that surface is finished as specified in the engineering drawings and job specifications.	
Demonstrate the ability to perform final inspection using precision measuring instruments and checking devices including inside and outside micrometers, vernier height gauges or indicators, gauge blocks, and pin gauges to ensure that the tolerances and dimensions of the workpiece conform to the engineering drawings and job specifications.	
Demonstrate the ability to complete work documentation including tracking sheets, sign-off sheets, inspection reports, or procedure sheets, to record the finalization of jobs and to facilitate traceability of work-in-process, ensuring that all data is recorded accurately and clearly in accordance with engineering drawings and job specifications.	
Demonstrate the ability to show proper care of precision measuring tools.	

**Performance Objective:** Demonstrate the ability to use advanced metrology equipment, such as optical comparators and CMMs.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to use optical comparators, optical flats and microscopes.	
Demonstrate the ability to use vision systems for product inspection (digital cameras, in-line optical sensors and other digital systems).	
Demonstrate the ability to use a Coordinate Measuring Machine (CMM) to locate datums, target points and areas and hole positions.	

**DOL Standard:** Benchwork: Apply a working knowledge of the processes and tools required for to complete benchwork activities.

**Performance Objective:** Demonstrate the ability to safely and properly use hand and power tools.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the safe and proper use of a bench vise.	
Demonstrate the safe and proper use of a ball-peened hammer.	



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Demonstrate the safe and proper use of a soft faced hammer.	
Demonstrate the safe and proper use of a standard screw driver.	
Demonstrate the safe and proper use of a phillips screw driver.	
Demonstrate the safe and proper use of an offset screw driver.	
Demonstrate the safe and proper use of a hand hacksaw.	
Demonstrate the safe and proper use of a machinist's file.	
Demonstrate the safe and proper use of precision files.	
Demonstrate the safe and proper use of rotary and bur files.	
Demonstrate how to safely hand tap through tapering, plugging or bottoming.	
Demonstrate the safe and proper use of a T-handle wrench.	
Demonstrate the safe and proper use of a double-ended tap wrench.	
Demonstrate the safe and proper use of a tap extractor.	
Demonstrate how to thread dies.	
Demonstrate the safe and proper use of a solid hand reamer.	
Demonstrate the safe and proper use of an expansion hand reamer.	
Demonstrate the safe and proper use of an adjustable hand reamer.	
Demonstrate the safe and proper use of a roughing taper reamer.	
Demonstrate the safe and proper use of a finish taper reamer.	
Demonstrate how to prepare the layout table surface for metalwork.	
Demonstrate the safe and proper use of a pocket or double ended scribe.	
Demonstrate the safe and proper use of a combination square set.	
Demonstrate the safe and proper use of a surface gauge.	
Demonstrate the safe and proper use of a vernier height gauge.	
Demonstrate the safe and proper use of angular layout tools (bevel protractor head, rule, and universal bevel protractor).	
Demonstrate the safe and proper use of circular layout tools (dividers, trammels, center head and rule).	
Demonstrate the safe and proper use of permanent layout tools (pocket scribe, rule or straight edge, prick punch, automatic center punch).	
Demonstrate the safe and proper use of an angle plate.	
Demonstrate the safe and proper use of a toolmaker's clamp.	
Demonstrate the safe and proper use of a parallels.	



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Demonstrate the safe and proper use of V-blocks.	
Demonstrate the safe and proper use of keyseat rules.	

**Performance Objective:** Demonstrate the ability to interpret part drawing specifications, select and use hand and power tools to meet part specifications and tolerances within a company's workflow.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to use a hand-file including (flat, needle, bastard, rat-tail, lathe, and half-round files) to remove excessive material so that workpiece is filed in accordance with engineering drawings and job specifications.	
Demonstrate the ability to use a hand-saw to cut the workpiece to specified lengths in accordance with engineering drawings and job specifications.	
Demonstrate the ability to hand-drill holes, using power drill and drill bits, so that the size of the drilled holes will conform to engineering drawings and job specifications.	
Demonstrate the ability to hand-tap threaded holes, using T-handle, and tapping block so that the depth and squareness of tapped threads will conform to engineering drawings and job specifications.	
Demonstrate the ability to hand-ream, using straight or spiral-fluted reamers, to remove excessive material so that the diameter and depth of reamed hole will conform to engineering drawings and job specifications.	
Demonstrate the ability to chase threads using hand taps and dies to repair or clean damaged threads, so that the threads will conform to engineering drawings and job specifications.	
Demonstrate the ability to hand-grind, using pneumatic or electric hand grinders, to remove excess material so that the workpiece is ground in accordance with engineering drawings and job specifications.	
Demonstrate the ability to deburr workpiece using files, scrapers, emery cloth, sanders, and hand or pedestal grinders to remove excess material and to ensure safe handling in accordance with engineering drawings and job specifications.	
Demonstrate the ability to practice good housekeeping in the workplace by cleaning up spills or leaks, keeping work area clean and clear of obstructions, and storing tools or equipment so that the potential for accident or injury is prevented and tools or equipment are in place and available in compliance with safety regulations.	

**DOL Standard:** Sawing: Apply a working knowledge for setting up, operating, or tending to machines that saw, cut or shear materials during the removal of metal, within a defined tolerance, to be used in further machining or fabrication processes.

**Performance Objective:** Demonstrate the ability to safely setup and operate machine tools to perform routine sawing operations.



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Performance Indicator	Qualification Date/Initial
Demonstrate the ability to check fused/welded blade to ensure that joined saw has a continuous cutting edge in accordance with manufacturer’s manual or job specifications.	
Demonstrate the ability to locate and position the workpiece in the saw to the required operational clearance by setting up workholding devices, including nesting fixtures, vises, or roller supports, so that the workpiece is aligned, secured, and stable during sawing operations in accordance with job specifications.	
Demonstrate the ability to select speeds and feeds of saws using the speed and feed charts and in accordance with the size, type, and hardness of workpiece material, so that the saw performs optimum cutting without damage to workpiece, cutting tools, or machines, and ensures personal safety.	
Demonstrate the ability to install and test-run blade to check alignments and movements so that the blade makes the required cut, prevents machine or blade damage and ensures personal safety in accordance with company standards.	
Demonstrate the ability to check first cut-off by measuring and checking a cut-off piece to ensure that the angles, squareness, and length of the sawed piece will conform to the engineering drawings and job specifications.	
Demonstrate the ability to cut shapes (vertical bandsaw) using required sawing sequences, speeds, feeds, and cutting fluids, so that the profile, size, and dimensions of the cut shapes conform to the engineering drawings, job specifications.	
Demonstrate the ability to cut squared and angled surfaces (power cut-off saw) using required sawing sequences, speeds, feeds, and cutting fluids, so that the squareness, angles, and size of cut surfaces conform to engineering drawings, job specifications.	
Demonstrate the ability to maintain material identification by marking or stamping the workpiece and completing shop documentation to facilitate traceability of the final product or work-in-process and maintain inventory control in accordance with company standards.	
Demonstrate the ability to deburr the workpiece using files, scrapers, emery cloth, sanders and hand or pedestal grinders to remove excess material and ensure safe handling in accordance with engineering drawings, job specifications.	
Demonstrate the ability to perform final inspection using precision measuring instruments and checking devices including inside and outside micrometers, vernier height gauges or indicators, gauge blocks, and pin gauges to ensure that the tolerances and dimensions of the workpiece to conform to the engineering drawings and job specifications.	
Demonstrate the ability to complete work documentation including tracking sheets, sign-off sheets, inspection reports, or procedure sheets to record the finalization of jobs and to facilitate traceability of work-in-process and ensure that data is recorded accurately and clearly in accordance with engineering drawings and job specifications.	
Demonstrate the ability to practice good housekeeping in the workplace by cleaning up spills or leaks, keeping work area clean and clear of obstructions, and storing tools or equipment so that	



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the potential for accident or injury is prevented and tools or equipment are in place and available in compliance with safety regulations.	
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**Standard:** Drilling: Apply a working knowledge for setting up, operating, or tending to machines that drill, bore, ream, or countersink work pieces to specifications.

**Performance Objective:** Demonstrate the ability to safely setup and operate machine tools to perform routine drilling operations.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to select drill tooling including drill bits, center-drill, reamers, taps, counter-bores, counter- sinks, and spot-faces by using information in engineering drawings and job specifications to ensure that tooling is the correct size, shape, type, and grade for the application.	
Demonstrate the ability to identify and prepare cutting tools for drills by sharpening or replacing tools so that the cutting shape and angle is prepared for optimum cutting and personal safety in accordance with job or manufacturer's specifications and company standards.	
Demonstrate the ability to locate and position the workpiece in the drill to the required operational clearances by setting up and securing workpiece with workholding devices, including drilling vises, clamps, jigs, angle plates, and chucks, so that the workpiece is aligned, secured, and stable during drilling in accordance with job specifications.	
Demonstrate the ability to set up tooling in the drills to the required operational alignments using holding devices, including drill chucks, taper sleeves, and tapping heads, to ensure that tooling is in position and held securely during drilling in accordance with job specifications.	
Demonstrate the ability to select speeds and feeds for the drill using speed and feed charts and in accordance with the size, type, and hardness of workpiece material so that the drill performs optimum cutting without damage to workpiece, cutting tools, or machines, and ensures personal safety.	
Demonstrate the ability to perform a center-drill a layout punch mark using a drill press/machine, chuck, center-drill, and cutting fluid, so that the punch mark is drilled in accordance with engineering drawings and job specifications.	
Demonstrate the ability to drill a hole using a drilling machine, drill bits, and cutting fluids so that the size and depth of drilled hole conforms to engineering drawings and job specifications.	
Demonstrate the ability to chamfer a hole using a drilling machine, countersinks, and cutting fluids to break sharp edges, so that the chamfered hole conforms to engineering drawings and job specifications.	





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Demonstrate the ability to ream a hole using a drilling machine, reamers, and cutting fluids so that the diameter of the reamed hole conforms to engineering drawing or job specifications.	
Demonstrate the ability to machine-thread a hole using a drilling machine, tapping heads, taps, and cutting fluids so that the depth, size, and pitch of the threaded depth of the hole to conform with engineering drawings and job specifications.	
Demonstrate the ability to spot-face a hole using a drilling machine, spot-facing tools, and cutting fluids so that the depth and diameter of the spot-faced hole conforms to engineering drawings or job specifications.	
Demonstrate the ability to counter-bore a hole using a drilling machine, counter-boring tools, and cutting fluids so that the depth and diameter of the counter-bored hole conforms to engineering drawings and job specifications.	
Demonstrate the ability to counter-sink a hole using a drilling machine, countersinks, and cutting fluids so that the depth and diameter of the counter-sunk hole conforms to engineering drawings and job specifications.	
Demonstrate the ability to maintain material identification by marking or stamping the workpiece and completing shop documentation to facilitate traceability of the final product or work-in-process and maintain inventory control in accordance with company standards.	
Demonstrate the ability to deburr the workpiece using files, scrapers, emery cloth, sanders and hand or pedestal grinders to remove excess material and ensure safe handling in accordance with engineering drawings, job specifications.	
Demonstrate the ability to perform final inspection using precision measuring instruments and checking devices including inside and outside micrometers, vernier height gauges or indicators, gauge blocks, and pin gauges to ensure that the tolerances and dimensions of the workpiece to conform to the engineering drawings and job specifications.	
Demonstrate the ability to complete work documentation including tracking sheets, sign-off sheets, inspection reports, or procedure sheets to record the finalization of jobs and to facilitate traceability of work-in-process and ensure that data is recorded accurately and clearly in accordance with engineering drawings and job specifications.	
Demonstrate the ability to practice good housekeeping in the workplace by cleaning up spills or leaks, keeping work area clean and clear of obstructions, and storing tools or equipment so that the potential for accident or injury is prevented and tools or equipment are in place and available in compliance with safety regulations.	

**Standard:** Grinding: Apply a working knowledge for setting up, operating, or tending to machines that finish, shape and size a workface to meet required hardness and finish specifications.

**Performance Objective:** Demonstrate the ability to safely setup and operate machine tools to perform routine grinding operations.



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Demonstrate the ability to select a grinding wheel using information in engineering drawings, charts, and job specifications to ensure that the wheel selected is the correct grade and size needed to finish, shape, and size workface in accordance with the hardness and finish of the workpiece and job specifications.	
Demonstrate the ability to check condition of the grinding wheel for defects, cracks, or chips, and by taking the corrective action or replacing if required, to ensure personal safety and to perform optimum cutting in accordance with job specifications.	
Demonstrate the ability to install the grinding wheel to specified radii and tangents and/or angles using diamond or star-wheel dresser, to ensure personal safety and to perform optimum grinding in accordance with job specifications.	
Demonstrate the ability to locate and position the workpiece in the grinder to the required operational clearances by setting up workholding devices, including angle plate, magnetic holders, vises, chucks, centers, jigs, V-block, or mandrels, so that the workpiece is aligned, secured, and stable during grinding operations in accordance with job specifications.	
Demonstrate the ability to surface grind the workpiece using surface grinders so that the finish, flatness, and size of ground surfaces conform to engineering drawings and job specifications.	
Demonstrate the ability to hone holes using a honing machine and required attachments, so that the dimension and tolerance of the honed hole conforms to engineering drawings and job specifications.	
Demonstrate the ability to lap the workpiece by hand grinding or using a power lapping machine so that the finish and flatness of the lapped surface conforms to engineering drawings and job specifications.	
Demonstrate the ability to grind inside and outside diameters (ID/OD) using machine grinders so that the dimensions and tolerances of ground ID/OD surfaces conform to engineering drawings and job specifications.	
Demonstrate the ability to grind tools and cutters using pedestal, surface, or tool and cutter grinders, so that the ground cutting edge of the tools or cutters conforms to tool geometry standards to ensure optimum metal removal and finish.	
Demonstrate the ability to check ground surfaces using surface comparators to ensure that the surface is finished in as specified in the engineering drawings and job specifications.	
Demonstrate the ability to perform final inspection using precision measuring instruments and checking devices including inside and outside micrometers, vernier height gauges or indicators, gauge blocks, and pin gauges to ensure that the tolerances and dimensions of the workpiece to conform to the engineering drawings and job specifications.	
Demonstrate the ability to complete work documentation including tracking sheets, sign-off sheets, inspection reports, or procedure sheets to record the finalization of jobs and to	



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facilitate traceability of work-in-process and ensure that data is recorded accurately and clearly in accordance with engineering drawings and job specifications.	
Demonstrate the ability to practice good housekeeping in the workplace by cleaning up spills or leaks, keeping work area clean and clear of obstructions, and storing tools or equipment so that the potential for accident or injury is prevented and tools or equipment are in place and available in compliance with safety regulations.	

**Standard:** Turning: Apply a working knowledge for setting up, operating, or tending to machines that turn, bore, thread, form, or face metal materials, such as wire, rod, or bar stock to meet required specifications.

**Performance Objective:** Demonstrate the ability to safely setup and operate machine tools to perform routine turning operations.

Performance Indicator	Qualification Date/Initial
Demonstrate the ability to select lathe cutting tools, including drill bits, boring, parting, threading, facing, or turning tools, by using information from engineering drawings and job instructions to ensure that the tools selected are the correct ones needed to cut the workpiece material.	
Demonstrate the ability to identify and prepare lathe cutting tools by sharpening or replacing tools so that the cutting shape and angle is prepared for optimum cutting and personal safety, in accordance with manufacturer's specifications and company standards/procedures.	
Demonstrate the ability to locate and position workpiece in lathe to required operational clearances by setting up and securing workholding devices (chucks, face plates, centers, catch plates, steady rest, or tail stock) so that the workpiece is aligned, secured, and stable during machining in accordance with job specifications.	
Demonstrate the ability to set up lathe cutting tools to the required operational alignments using tool posts and tail stocks, to ensure that tools are in position and held securely during machining in accordance with job specifications.	
Demonstrate the ability to select speeds and feeds of lathe using speed and feed charts and in accordance with the size, type, and hardness of workpiece material, so that the lathe performs optimum cutting without damage to workpiece, cutting tools, or machine and ensures personal safety in accordance with job specifications.	
Demonstrate the ability to take a sizing cut to determine a reference workface and to check speeds and feeds to ensure that lathe is set up in accordance with engineering drawings and job specifications.	
Demonstrate the ability to establish a reference or starting point (datum) by zeroing out machine and ensuring that the datum is correctly located in accordance with job specifications.	



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Demonstrate the ability to face a surface using a lathe and single-point tool bit and by measuring or checking with vernier, straight edge, or micrometer, so that the surface flatness and finished edge conforms to engineering drawings and job specifications.	
Demonstrate the ability to turn an external diameter using a lathe and single-point tool and by measuring or checking with a vernier or micrometer, so that the turned diameter conforms to engineering drawings and job specifications.	
Demonstrate the ability to drill a hole using a lathe, center-drill, drills, and tailstock, so that the diameter and depth of the drilled hole conforms to engineering drawings and job specifications.	
Demonstrate the ability to bore an internal diameter using a lathe and boring bars mounted in a tool post, so that the close-toleranced internal diameters conform to engineering drawings and job specifications.	
Demonstrate the ability to ream a hole using a lathe, center-drill, drills, reamers, and tail-stock, and by measuring or checking with vernier, micrometer, and gauges so that the depth and diameter of the reamed hole conforms to job specifications.	
Demonstrate the ability to tap a hole using a lathe, taps, tapping head, and tailstock, so that the depth, diameter, and thread pitch of the tapped hole conforms to job specifications.	
Demonstrate the ability to turn an internal or external thread using a lathe and single-point tool bit and by measuring or checking with thread micrometers and thread plug gauge (go-no-go), so that the pitch, geometrical form, and dimensional tolerance of the turned thread conforms to job specifications and thread standards.	
Demonstrate the ability to produce a taper using a lathe, offset tail stock, taper-turning attachment, and compound rest, and by measuring or checking with protractors, micrometers, vernier height gauges, or templates, so that the size and angle of turned taper conforms to job specifications.	
Demonstrate the ability to knurl cylindrical surface patterns using a lathe and knurling tools, so that the diameter, form, depth, and finish of the knurled surface patterns conform to job specifications.	
Demonstrate the ability to groove and part-off using a lathe and grooving or parting tools, so that the width, length, depth, and square of cut-offs conform to job specifications.	
Demonstrate the ability to maintain material identification by marking or stamping the workpiece and completing shop documentation to facilitate traceability of the final product or work-in-process and maintain inventory control in accordance with company standards.	
Demonstrate the ability to deburr the workpiece using files, scrapers, emery cloth, sanders and hand or pedestal grinders to remove excess material and ensure safe handling in accordance with job specifications.	
Demonstrate the ability to perform final inspection using precision measuring instruments and checking devices including inside and outside micrometers, vernier height gauges or indicators,	



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gauge blocks, and pin gauges to ensure that the tolerances and dimensions of the workpiece to conform to job specifications.	
Demonstrate the ability to complete work documentation including tracking sheets, sign-off sheets, inspection reports, or procedure sheets to record the finalization of jobs and to facilitate traceability of work-in-process and ensure that data is recorded accurately and clearly in accordance with job specifications.	
Demonstrate the ability to practice good housekeeping in the workplace by cleaning up spills or leaks, keeping work area clean and clear of obstructions, and storing tools or equipment so that the potential for accident or injury is prevented and tools or equipment are in place and available in compliance with safety regulations.	

**Standard:** Milling - Apply a working knowledge for setting up, operating, or tending to machines that mill, plane, shape, groove, or profile metal work pieces to meet required specifications.

**Performance Objective:** Demonstrate the ability to safely setup and operate machine tools to perform routine milling operations.

<b>Performance Indicator</b>	<b>Qualification Date/Initial</b>
Demonstrate the ability to select milling cutting tools (end mills, face mills, shell cutters, slot drills, boring bars, slitting saws, and boring head) by using information from engineering drawings and job instructions to ensure that the tools selected are the correct ones needed to mill the workpiece to specifications.	
Demonstrate the ability to identify and prepare milling cutting tools by sharpening or replacing tools so that the cutting shape and angle is prepared for optimum cutting and personal safety in accordance with manufacturer’s specifications and company standards.	
Demonstrate the ability to set-up and maintain milling adjustable support tools (indexing heads, vises, angle plates, sine bars, and tables) ensuring that the support tool is the correct one for the application and the workpiece is located and secured during machining in accordance with job specifications.	
Demonstrate the ability to set-up milling cutting tools to required operational alignments using arbors, collets, and drill chucks to ensure the tools are in position and held securely during machining in accordance with job specifications.	
Demonstrate the ability to select speeds and feeds of lathe using speed and feed charts and in accordance with the size, type, and hardness of workpiece material, so that the mill performs optimum cutting without damage to workpiece, cutting tools, or machine and ensures personal safety in accordance with job specifications.	



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Demonstrate the ability to perform fly-cutting using a milling machine, single-point tool bit, and required cutting fluid so that the size, shape, squareness, and flatness of the fly-cut workpiece conforms to job specifications.	
Demonstrate the ability to face-mill using a milling machine, multi-point tool bit, face mill, and required cutting fluids so that the size, shape, squareness, and flatness of the faced workpiece conform to job specifications.	
Demonstrate the ability to machine steps, cut-outs, angles, and open slots using a milling machine, end mill, and required cutting fluid so that the size, shape, and angle of the end-milled workpiece conforms to job specifications.	
Demonstrate the ability to machine a pocket or slot using a milling machine, slot drill, center cutting end mill, and required cutting fluid so that the size, shape, and angle of milled pockets or slots conform to job specifications.	
Demonstrate the ability to machine a hole using a milling machine, drill bits, reamers, slot drills, and required cutting fluid so that the diameter, depth, and tolerance of the milled hole conforms to job specifications.	
Demonstrate the ability to bore holes using a milling machine, boring bar, boring head, and required cutting fluid so that the diameter, finish, depth and location of the bored hole conforms to job specifications.	
Demonstrate the ability to deburr the workpiece using files, scrapers, emery cloth, sanders and hand or pedestal grinders to remove excess material and ensure safe handling in accordance with engineering drawings, job specifications.	
Demonstrate the ability to perform final inspection using precision measuring instruments and checking devices including inside and outside micrometers, vernier height gauges or indicators, gauge blocks, and pin gauges to ensure that the tolerances and dimensions of the workpiece to conform to the engineering drawings and job specifications.	
Demonstrate the ability to complete work documentation including tracking sheets, sign-off sheets, inspection reports, or procedure sheets to record the finalization of jobs and to facilitate traceability of work-in-process and ensure that data is recorded accurately and clearly in accordance with engineering drawings and job specifications.	
Demonstrate the ability to practice good housekeeping in the workplace by cleaning up spills or leaks, keeping work area clean and clear of obstructions, and storing tools or equipment so that the potential for accident or injury is prevented and tools or equipment are in place and available in compliance with safety regulations.	



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<b>Apprentice Signature:</b>	<b>Completed:</b> MM/DD/YY
<b>Mentor Signature:</b>	<b>Completed:</b> MM/DD/YY
<b>Supervisor Signature:</b>	<b>Completed:</b> MM/DD/YY
<b>Comments:</b>	