WAGE GRADE CAREER PATH

WG 3414	Machining

This occupation covers nonsupervisory work involved in the manufacture of parts and items of equipment from castings, forgings, and other raw stocks made of various metals, metal alloys, and other materials, and/or machining operations required in the repair of such items. The work requires the use of various types of conventional and/or computer numerical control (CNC) machine tools and their attachments to perform machining operations in the repair and/or manufacture of parts from raw stock. The work performed by machine tool operators requires basic knowledge of machining processes and skill in performing machining operations such as boring, drilling, planing, milling, and turning on milling machines, radial, or multiple spindle drill presses, shapers, planers, lathes, or equivalent types of conventional and/or CNC machine tools. The work performed by machinists requires skill in the initial planning of necessary work sequences, laying out reference points and lines to be followed in the machining processes, planning for and setting up the work in the machine, sometimes programming the cutter path, selecting and shaping metal cutting tools and inserts, operating all types of machine tools , and performing precision handwork to fit, finish, and assemble machined parts and equipment. The work also requires knowledge of the makeup of blueprints and drawings and the skill necessary to interpret them; and skill in working from other types of specifications such as sketches, models of parts to be manufactured, or work orders.

	Step	
WG02 - WG05		**Part 1** **Apprentice/Helper/Trainee; Trade/Less than Journeyman**
	1	Complete New Hire Orientation
	2	Complete Civilian Training Plan requirements for current position
	3	Complete task qualifications for current position
	4	Complete task certifications for current position
	5	Master simple to common work tasks under supervision
	6	Maintain successful to above average performance ratings
WG05 - WG08		**Part 2** **Trade/Less than Journeyman**
	1	Continue required on-the-job and formal classroom training required in Civilian Training Plan
	2	Complete task qualifications for current position
	3	Complete task certifications for current position
	4	Master common to complex work tasks. Grade 8 machine tool operators have skill in performing machine operations on conventional and CNC machine tools such as lathes, boring mills, milling machines, grinding machines, shapers, planers, or radial drills after the machine has been set up and checked for proper operation by a higher grade worker.They have the ability to follow detailed instructions concerning the location of necessary dimensions on blueprints, sequence of machine operations, machine feeds and speeds, tools to be used, alignment processes, and predetermined machined dimensions. They have skill in aligning parts in the machine according to set methods and given reference points, exercising care to keep material, holding fixtures, and machine stops clear of chips and particles. They use knowledge of machine operations to enable them to recognize defective tooling, improper coolant flow, the need for changing speeds or feeds, machine malfunctions, or obvious dimensional deviations and either correct the problem by adjusting the machine, cutting tool, or fixture or obtaining assistance from a higher grade worker. Grade 8 operators have skill in the use of measuring instruments such as internal and external micrometers, vernier height and depth gages, indicators, scales, and various standard or preset snap, plug, or ring gages to check the accuracy of dimensions or they maintain dimensions through the use of fixtures or preset machine stops, depending upon the dimensional tolerances allowed.
	5	Maintain successful to above average performance ratings
		Part 3 **Journeyman**
	1	Continue required on-the-job and formal classroom training required in Civilian Training Plan
	2	Complete task qualifications for current position
	3	Complete task certifications for current position
	4	Master common to complex work tasks. At Grade 9 machine tool operators have skill in operating the same machine tools as operators at the grade 8 level; however, they extend the scope of operations on these machines by applying additional skill in using various standard machine attachments such as rotary tables, magnetic chucks, gear changing boxes, angular drive heads, taper attachments, and universal milling attachments; and have skill in performing precision work on parts that present complex configurations and close tolerances between interrelated surfaces. They have skill in the operation of CNC machine tools when the manual input required is limited to changes in coolant flow, increases or decreases in speeds and feeds, or stops are programmed for dimensional checks or minor adjustments. While grade 8 machine tool operators have most jobs set up for them, grade 9 operators have skill in normal machine set ups. They have the ability to read and interpret blueprints, program readouts, and technical directives to determine and obtain materials and cutting tools for the job and to visualize the finished part and critical surfaces, dimensions, and tolerances. Grade 9 operators have knowledge of various metals, alloys, and other materials and their machining characteristics that enable them to select the proper cutting tools and determine correct machine feeds and speeds necessary to perform the job. They have skill in the use of measuring instruments such as internal and external micrometers, vernier height and depth gages, indicators, scales, and various types of snap, plug, and ring gages to achieve and maintain critical dimensions and tolerances during the machining process.
	5	Master common to complex work tasks. At Grade 10 machinists have skill in performing the full range of machining operations on most types of conventional or CNC machine tools and their various attachments. They have knowledge of various metals and other materials such as aluminum, brass, bronze, high carbon and alloy steels, chrome, nickel, titanium, molybdenum, super alloys, nylon, rubber, plastics, teflon, etc. to produce the desired cuts and finishes on each material. They have skill to plan and lay out work from blueprints, work sheets, and drawings that may have missing or incorrect information. They have skill in determining work procedures, machine, tools, equipment, and attachments to be used; proper type and size of raw stock; sequence of machining operations, and the speeds and feeds necessary to attain the required finishes and tolerances. On CNC machines, they have skill to setup and operate a variety of machine tools and to debug programs developed by higher grade workers to perform machining operations involving Level 1 complexity. They have knowledge of a variety of machine controls and have skill in making necessary manual inputs to insure accurate dimensional tolerances. Grade 10 machinists have a knowledge of trade mathematics including plane geometry and the use of trigonometric functions and machinist handbook formulas in establishing needed dimensions, such as those required for chasing threads or machining angular surfaces; locating and marking surfaces and angles to be machined, locating reference points, or performing other layout work necessary to facilitate accurate job setups on a variety of conventional or CNC machine tools. They have skill in manufacturing an entire item, carrying out all the machining operations necessary for completion, and performing precision handwork such as filing, scraping and lapping to fit, assemble, and finish machined parts. Grade 10 machinists have skill in using many types of precision instruments and equipment such as vernier calipers, height gages, squares, protractors, inside, outside and depth micrometers, surface gages, vee blocks, parallel bars, gage blocks, dial indicators, optical and mechanical comparators, ring, bore and plug gages to attain accurate dimensions and maintain tolerances.

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	6	Master common to complex work tasks. At Grade 11 machinists apply a comprehensive knowledge of and skill in using any of the accepted trade methods and techniques, and any of the conventional types and/or CNC machine tools. They exercise skill and ingenuity in using conventional machine tools and their attachments to perform machining processes requiring special adaption of the equipment or processes for which they were not specifically designed, for example, through the use of special or improvised tools, fixtures, and setups to machine unusual surface configurations such as curved surfaces requiring machine feeds in different planes simultaneously; surfaces having closely interrelated dimensions, or surfaces having unusual or compound angular relationships. They have skill in programming machining operations, setting up, and operating CNC machine tools. They have skill to operate machines through one complete cycle to manufacture the first part; to proof part dimensions; to check sufficiency of programming, tooling, fixturing, and machine operations, to edit the program on CNC machines and make the normal changes required; to recommend changes to CNC machine tool tape programs on deficiencies noted; and to coordinate directly with the parts programmer or toolmaker. They have skill to operate CNC machines in automatic and semiautomatic mode and to make logical decisions at each program stop or decision point to manually input, change, adjust, or otherwise complete the machine instructions to produce a quality finished product and prevent machine collision and damage to machine tooling or part. Grade 11 machinists apply a knowledge of software, flow sequence, flow time inspection requirements and operations of computer numerical control machines to help engineering personnel develop software specifications to complement equipment specifications for CNC equipment procurement i.e., machine tools, flexible machining systems, robots, and automated inspection equipment. Grade 11 machinists have a thorough knowledge of advanced shop mathematics. They have skill in using geometric and trigonometric formulas to compute compound angles, angular indexing, hole patterns, pitch lead, and pitch diameters for various standard and non-standard screw threads. They have skill in determining proper values for contour standard and non-standard screw threads and determining proper values for contour and circular interpolation milling for manual programming. They have skill in setting up machines to machine unusual or compound angles. Grade 11 machinists have skill in performing work assignments that require accomplishing untried tasks or procedures such as those required in machining a rare metal, new metal alloy, or other new material for which they determine the best tooling material, tool types, coolants, and machine feeds and speeds to use in performing a particular machining operation; or independent interpretation and translation of work orders, drawings, and specifications frequently requiring computing and establishing missing tolerances, dimensions, and types of fits and finishes. Because work assignments are usually more general at this level and may involve related work processes, grade 11 machinists apply a knowledge of the effect and relationship of heat treating, annealing, plating, welding, and other related work processes on various machining operations in completing an assignment. Based on their overall knowledge of the trade, they plan sequence of operations that involve innovations in setups, attachments, techniques, and tooling. Grade 11 machinists use a thorough knowledge of all aspects of the machining operation as well as extensive knowledge of related trades in order to resolve problems concerning complex machining operations or procedures and to suggest more efficient or economic machining processes where necessary.
	7	Provide production support services
	8	Maintain successful to above average performance ratings

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