Federal Wage System Job Grading Standard for Toolmaking, 3416

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WORK COVERED

This standard covers nonsupervisory work involved in the fabrication, manufacture, calibration, reconditioning, and repair of machine tools, jigs, fixtures, dies, punches, and gages used in the manufacture, overhaul, and repair of equipment.

WORK NOT COVERED

The following kinds of work are not covered by this standard:

-- Manufacturing, repairing, and maintaining dies used for drop forgings or press operations;

-- Grinding and sharpening cutting tools or grinding cutting tools to produce special shapes or to change cutting characteristics;

-- Making metal patterns for castings; and

-- Maintaining and making minor repairs and adjustments to precision measuring instruments and tools in a toolcrib or toolroom.

TITLES

Jobs graded by this standard are to be titled *Toolmaker*.

GRADE LEVELS

This standard does not describe all possible grade levels at which jobs may be established. If jobs differ substantially from the skill, knowledge, and other requirements described by this standard, they may warrant grading either above or below these levels.

TOOLMAKER, GRADE 11

General: Grade 11 toolmakers fabricate, overhaul, and repair standard types of cutting tools such as drills, reamers, milling cutters, and carbide tools; jigs and fixtures; drilling templates; punching, forming, and blanking dies; and gages such as plug, ring, snap, and caliper gages. They perform duties in accordance with general instructions from their supervisor which normally include detailed blueprints or drawings, and specifications as to the material to be used and design of the end item.

Skill and Knowledge: Grade 11 toolmakers must apply a comprehensive knowledge of and be skilled in using a variety of machine shop practices and techniques.

Workers at this level must be skilled in planning and laying out work from blueprints, sketches, or other work specifications; applying advanced shop mathematics and handbook formulas to compute dimensions and plan and layout work; setting up and operating all conventional machine tools and attachments; selecting proper tools and machine operations to be used; and performing necessary handwork such as filing, scraping, grinding, and lapping to finish and assemble items.

They must have a knowledge of standard cutting tools such as drills, reamers, taps, different kinds of milling cutters, form tools, and various carbide tools; the proper clearance and relief angles required on such tools based on the material to be machined; and the type of grit and bond, and size of grinding wheels needed to form and sharpen such tools.

Grade 11 toolmakers must have a knowledge of the construction of standard types of jigs and fixtures and their uses in the machine shop. They must be sufficiently familiar with punches and dies and their principles of operation to enable him to fabricate and assemble such types as are used for straight punching, forming, and blanking operations. They must have sufficient knowledge of commonly used plug, ring, snap, and caliper gages and their critical dimensions to enable them to fabricate these less complex types of gages to close tolerances.

Grade 11 toolmakers must be familiar with and capable of using numerous types of measuring devices such as vernier calipers, height gages, squares, protractors, inside, outside, and depth micrometers, surface gages, vee blocks, parallels, space blocks, dial indicators, and optical and mechanical comparators to attain accurate dimensions and close tolerances.

They must be familiar with hardening and annealing processes and their effect on the machinability of metals, and the dimensional allowances necessary to accommodate these processes.

Responsibility: Grade 11 toolmakers receive work assignments from a supervisor in the form of blueprints, sketches, or drawings, and specifications or oral instructions which provide information on materials and tool design principles to be incorporated in the item to be made.

They must determine and organize their work procedures and machining processes; note and provide for critical dimensions; and apply shop mathematics and handbook formulas to calculate dimensions such as those needed in determining center distances, angles, tapers, clearances, pitches, and leads.

Grade 11 toolmakers work with and obtains guidance from a higher level journey workers or supervisor on such things as the purpose the tooling device is to serve and any special features desired; and to determine the best proven gage, jig, or fixture design principles to be used to meet specific operational requirements.

Work is reviewed by the supervisor while in process and upon completion to see that it meets specifications arid accepted trade standards.

Physical Effort: The work in this occupation requires standing, stooping, bending, and reaching; moderate lifting up to 18 kilograms (40 pounds) when moving machine attachments and work pieces. Hoists, hand trucks, lifts, and other workers are available to assist with heavier items.

Working Conditions: Grade 11 toolmakers normally work inside in a machine shop environment wherein there is danger to the skin and eyes from flying metal chips, abrasive particles, and hot metal; possibility of skin irritations from contact with coolants, lubricants, and abrasive compounds; danger to the fingers, hands, and other parts of the body from cutting tools, grinding wheels, rotating work pieces, and moving parts of machines. The workers are subjected to the usual dirt and noise of machine shop activities.

TOOLMAKER, GRADE 13

General: Grade 13 toolmakers fabricate overhaul, calibrate, and repair, tools, jigs, fixtures, and gages used by workers performing machining and assembly work; develop, fabricate, and repair various types of punches and dies for use in metal working press operations; and fabricate and repair molds for use in molding and shaping plastics, rubber, and other materials. They may supply information to other trades relative to proper use of these items.

The work performed requires a high degree of skilled workmanship in the planning, layout, machining, assembly, and hand finishing of work to precise dimensions and close tolerances.

Grade 13 toolmakers receive assignments through work orders or oral instructions normally accompanied by blueprints, sketches, or a model of the piece to be manufactured in the machine shop. They are often required to visit the job-site to study his assignment. They independently plan the sequence of operations, obtain material, lay out work, calculate necessary dimensions and tolerances, and determine and plan for performance of related operations such as heat treating, plating, etc., assemble tool or fixture and check functional performances making necessary changes. General instructions and suggestions are provided by the supervisor concerning unusual work or design changes.

Skill and Knowledge: Grade 13 Toolmakers apply a comprehensive knowledge of a wide variety of machine shop procedures and techniques and shop mathematics, as well as a high degree of skilled workmanship, in planning, laying out, machining, assembling, and hand fitting and finishing work to precise dimensions and close tolerances. They must have a knowledge of the physical properties of numerous metals, metal alloys, plastics, rubber, and other materials in order to determine their adaptability to the specifications required of the item to be made.

They must have an intimate knowledge of and the ability to read and interpret complex multiview mechanical drawings and sketches, or the ability to develop and prepare their own sketches from oral or written instructions, to enable them to calculate and work to precise dimensions and very close tolerances, make detailed and exact work layouts, and accomplish complex machine setups.

Grade 13 toolmakers must have a working knowledge of and be able to use all precision measuring instruments common to the trade including vernier calipers, height gages, optical and electrical comparators, dial indicators, Johanssen and similar gage blocks, and various types of micrometers and supermicrometers. Similarly, they must use other types of measuring devices such as scales, dividers, surface gages, sine bars, protractors, steel squares, optical flats, and straight edges.

They must be able to adapt and set up common machine tools to perform special and precise machining operations by devising and constructing their own fixtures and holding devices. Grade 13 toolmakers must also be skilled in the setup and operation of specialized and precision machines such as jig borers, jig grinders, internal and external thread grinders, and various types of electrical discharge machines to manufacture, overhaul, and repair tools, dies, jigs, fixtures, molds and gages. Using precision measuring instruments and various fixtures and holding devices that they must often contrive, Grade 13 toolmakers must be able to check the accuracy of existing tools, jigs, fixtures, and gages; and fabricate, repair, modify and calibrate precision measuring instruments used in the machine shops such as vernier gages, various types of micrometers, plug and ring gages, snap gages, space blocks, and dial indicators.

Grade 13 toolmakers must be familiar with the effect of hardening, annealing and stress relieving on metals and metal alloys in order to choose the proper materials for specific items to be made and make dimensional allowances for these processes.

They must have a thorough knowledge of grit-type, grit-size, and various bonds used in grinding wheels and, based on this knowledge, select a wheel of the proper grit, bond, and diameter, and compute the correct surface speed to be used in accordance with the material to be ground, edge or radius to be held, or other critical factors.

Grade 13 toolmakers must have and maintain a knowledge of machine shop practices and processes, and keep abreast of technological changes as they occur and affect manufacturing procedures.

Responsibility: Grade 13 toolmakers receive assignments in the form of work orders or oral instructions usually accompanied by complex blueprints, sketches, drawings, or a model of the

item which the tool will be used to manufacture. They must independently organize and determine their own work procedures and machining processes; note and provide for critical dimensions; and use arithmetic, geometric and trigonometric formulas to calculate angles, distances between centers, tapers, clearances, and establish necessary tolerances. When working from oral instructions or sketches, WG-13 toolmakers must often consult with the requester in order to properly devise, plan, and manufacture the tooling item requested, assuming responsibility for the proper design by determining the purpose the tooling device is to serve and the design features desired. They apply proven gage, jig, and fixture design principles, and determine the application which is the most effective for operational requirements.

Grade 13 toolmakers may be assigned responsibility for checking and attesting to the dimensional accuracy of existing large and complex tools, jigs, fixtures, and gages and for making necessary corrections; and calibrating and repairing precision measuring tools to facilitate dependable accuracy on the part of workers in the machine shop.

They proceed on work assignments from initial assignment to completion. General supervision is provided in the form of instructions and suggestions by the supervisor concerning unusual work or design changes. Completed projects are checked only to see that the work meets specifications and accepted trade standards.

Physical Effort: Physical effort at this grade is the same as that for the grade 11 level.

Working Conditions: Working conditions at this grade are substantially the same as those at the grade 11 level.