



STATE OF NEW YORK
DEPARTMENT OF LABOR

APPENDIX A

DRAFTER (TOOL DESIGN)

D.O.T. CODE 007.621-022

O*NET CODE 17-3013.00

This training outline represents a minimum standard in terms of work processes and related instruction which are required to achieve skilled worker status. It is recognized that rapid technological and regulatory changes will frequently result in the need for mastery of additional on-the-job or theoretical instruction.

WORK PROCESSES

| | <u>Approximate Hours</u> |
|---|--------------------------|
| A. <u>Tools, Equipment and Work Aids</u> | 800 |
| 1. Familiarization with machine tools | |
| 2. Using and caring for print machine | |
| 3. CAD CAM: Using and caring for computer-aided drafting terminal, keyboard, mouse and/or stylus and digitizing tablet | |
| 4. Understanding and using sketches, rough drawings, designs, tool designer instructions, and pictorial drawings | |
| 5. Understanding and using industry specification manuals, handbooks, technical specifications, commercial catalogs, reference library resources, CAD manuals and tutorials | |
| 6. Using and caring for plotters, printers, Mylar, tracing paper | |
| 7. Documenting procedures, managing files; setting up project directories | |
| B. <u>Work Planning</u> | 300 |
| 1. Analyzing specifications, ideas, concepts, sketches, engineering drawings, and related data supplied by Tool Designer | |
| 2. Determining critical factors affecting design of tools | |
| 3. Applying knowledge of previous designs and manufacturing processes and limitations | |
| 4. Determining scale and method of presentation | |
| 5. Determining priorities, sequence of work | |
| 6. Following written procedures | |

- C. Blueprint Reading 400
1. Reading orthographic projections
 2. Reading geometric constructions
 3. Reading auxiliary views
 4. Reading sectional views
 5. Understanding dimensioning procedures
 6. Understanding geometric tolerancing and dimensioning
 7. Reading fastener and hardware blueprints
 8. Reading gear blueprints
 9. Reading layout and assembly blueprints
 10. Reading welding and tool industry symbols
- D. Basic Drafting 2,000
- Producing drawings of tool designs using CAD systems:
1. Sketching orthographic projections
 2. Drafting multiple view assemblies, sub-assemblies and layout drawings
 3. Determining sequence of work and method of presentation
 4. Demonstrating an understanding of the basics of production, repair and alteration of machine tools and related equipment
 5. Interpreting rough sketches, designs, notes, instructions, and specifications provided by tool designer
 6. Drafting detailed drawings of tools and related parts
 7. Drawing plans to scale, dimensioning
 8. Drawing fasteners and hardware when applicable
 9. Changing drawings using tracing paper, overlays, CAD systems
 10. Reproducing drawings
- E. Making Calculations 400
1. Understanding and using metric system
 2. Compiling tolerances and dimensions
 3. Checking dimensions and industry specifications of materials to be used
 4. Checking weights, volumes and stress factors provided by engineer or tool designer
 5. Consulting tool design handbooks, commercial catalogs, charts
 6. Projecting amount of materials required, assigning numbers to materials list (optional)
 7. Determining scale
 8. Calculating angles and curvature of parts
 9. Costing and estimating

F. Tool Design Drafting 2,800

Producing working drawings following designs and specifications indicated by Tool Designer:

1. Understanding basics of tool design methods, engineering principles and manufacturing
2. Identifying tolerances and dimensions
3. Applying standard tool manufacturing industry specifications
4. Drafting manufacturing drawings, layout drawings
5. Drafting detailed drawings of parts illustrating shape, conforming dimensions, tolerances, materials, finishes, and heat treatment where applicable
6. Drafting standard tool parts and devices such as drill jigs, gages, cams, single and multiple station dies, lathe tools, mill fixtures, assembly fixtures, welding fixtures, and circular form tools
7. Drafting tool presentation drawings
8. Drafting tool sectional drawings
9. Using basic knowledge of metallurgy to select appropriate schedule of materials
10. Drafting mechanical jigs and fixtures
11. Drawing cutting tool developments
12. Revising drawings, conferring with tool designers, engineers, tool makers or customers as appropriate
13. Assisting team to solve tool design problems; drawing revisions
14. Preparing optical comparator charts

G. CAD CAM Drafting 900

1. Applying knowledge of computer language
2. Using appropriate editing commands
3. Choosing between appropriate software and manual programming
4. Applying construction commands
5. Using object modification functions
6. Applying knowledge of exclusive features
7. Keeping abreast of new computer technology and software developments
8. Demonstrating mastery of advanced tasks and automatic programming

H. Assuring Quality 400

1. Inspecting finished drawings' detail for fit, form and function

H. Assuring Quality – continued

2. Checking accuracy of scale, dimensions, conformance to standards and design specifications
3. Checking symbols and conventions
4. Checking clarity of lines and figures
5. Applying international standards such as ISO 9000 and QS 9000
6. Modifying drawings as directed by Tool Designer
7. Conferring with work team throughout process

Total hours 8,000

Apprenticeship work processes are applicable only to training curricula for apprentices in approved programs. Apprenticeship work processes have no impact on classification determinations under Article 8 or 9 of the Labor Law. For guidance regarding classification for purposes of Article 8 or 9 of the Labor Law, please refer to <http://www.labor.state.ny.us/workerprotection/publicwork/PDFs/Article8FAQS.pdf>.

APPENDIX B

DRAFTER (TOOL DESIGN)

RELATED INSTRUCTION

Safety

Fundamentals including fire, electrical, Right-to-Know, OSHA and Emergency Procedure
Trade Safety including VDT Precautions, Ergonomics, machine shop and manufacturing floor safety
First Aid (minimum 6.5 hours every 3 years)

Blueprint Fundamentals

Reading, interpreting part prints
File management procedures
Drawing and Sketching
Blueprint Production
Orthographic Projections
Geometric Constructions
Sectional Views and Auxiliary Views
Dimensioning Procedures
Fasteners and Hardware
Gears
Layout and Assembly Drawings
Symbology, including welding and tool design symbols

Mathematics

Fundamentals
Applied Algebra
Applied Geometry, Geometric Construction
Applied Trigonometry
Applied Statistics, including Statistical Process Control
Metric System
Engineering Handbooks, Tables, and Reference Software
Technical Applications: calculating reduced scales, weights, tolerances, stress factors, verifying drawing and original part dimensions

Quality Control Process

Performing Quality Assurance Checks, record keeping
Modifying Drawings in conjunction with Engineering and Production Shop
Company standards, ISO 9000 standards, QS 9000 standards

Trade Theory

Tools, machines, and equipment, including knowledge of applicable machine tools
Materials and physical properties
Terminology
Drafting industry standards, operation and practice

Drafter (Tool Design) Related Instruction – continued

Trade Theory – continued

Reference materials, catalogs, engineering handbooks and software
Production shop layouts and operation
Mechanical and tool making processes, NC and CNC
Work Sequencing
Methods of Presentation: Geometric Constructions, Orthographic Projections, Auxiliary Views, Sectional Views
Machine Presentation Drawings
Lettering, Tracing, Trade Symbols
Layout and Assembly Drawings, Working Drawings

Trade Science

Background in Tool Design
Metallurgy
Heat Treatment
Applied Physics
Mechanics, Hydraulics and Pneumatics
Mechanical Drawing
Engineering Drawing and Graphics
Machine Tool Design
Machine manufacturing processes
Jigs and fixtures
Numerical Control Drafting
Presentation Renderings (Optional)

Computer Aided Drafting (CAD)

Introduction to basics of computer use including keyboard, stylus, mouse, and tablet
Set-up commands
Developing shapes and drawings descriptions
Developing dimension and scale descriptions
Editing commands
Construction commands and object modification
Plotting and projection
Customizing with programs such as “Auto CAD” including custom menus, creating special files, three dimension modeling
Advanced CAD applications to more complex tool design applications, two and three dimensional design
Overview of current CAD commercial packages and enhancements

Industrial and Labor Relations

History and Background
Current Laws and Practices

Communications: including management, customer, engineering and manufacturing

Decision Making and Problem Solving Techniques; Basic Problem Solving, Applied Decision Making, Group Team Concepts

Drafter (Tool Design) Related Instruction – continued

Applications of Electricity and Electronics to the Tool Design Drafter Trade

Sexual Harassment Prevention Training (minimum 3 hours)

Other Related Courses as Necessary

144 Hours of Related Instruction are Required for Each Apprentice for Each Year.