MACHINE BUILDER

APPENDIX A

O*NET CODE 51-2031.00

This training outline is a minimum standard for Work Processes and Related Instruction. Changes in technology and regulations may result in the need for additional on-the-job or classroom training.

WORK PROCESSES

Approximate Hours

A. Boring Mill, Horizontal **350**

1. Following all safety procedures and policies
2. Setting up work, using jigs, fixtures, vee blocks, bolts, straps, jacks, etc.
3. Rough boring, relief boring, deep boring, internal recessing, end bar boring, boring to shoulders, drilling, tapping, reaming, spotfacing, counterboring, chamfering, grooving, grinding tools
4. Adjusting feeds and speeds
5. Using numerically controlled hobos (if applicable)
6. Lubricating
7. NC programming (if applicable)
8. CNC programming (if applicable)

B. Lathe **350**

1. Following all safety procedures and policies
2. Using faceplate, different types of chucks, mandrels, steady rests, follow rests, taper attachments, compound and offset tailstock
3. Centering, straight turning, taper turning, facing, drilling, boring, reaming, necking, recessing, filing, lapping, tapping, polishing, thread cutting, knurling, form turning, eccentric turning, setting and grinding of tools
4. Adjusting feeds and speeds
5. Lubricating
6. NC programming (if applicable)
7. CNC programming (if applicable)

C. Radial and Sensitive Drills **170**

1. Following all safety procedures and policies
2. Laying out holes, setting up work using straps, clamps, jigs and fixtures. Using leveling gauges
3. Drilling, reaming, tapping, boring, spotfacing,
4. Using templates, grinding tools, setting tools
5. Lubricating
6. NC programming (if applicable)
7. CNC programming (if applicable)

D. Milling Machine **210**

1. Following all safety procedures and policies
2. Keyway milling, spline milling, horizontal milling, vertical milling, planning
3. Using fixtures, jigs, knees, and dividing head
4. Using turntable; boring, reaming and drilling
5. Milling splines, racks, squares, hexagons, spur gears, graduations, tee slots
6. Adjusting feeds and speeds
7. Lubricating
8. NC programming (if applicable)
9. CNC programming (if applicable)

E. Grinders **210**

1. Following all safety procedures and policies
2. Operating internal, external, rotary and surface grinders
3. Using magnetic chuck
4. Loading and blocking work on the table
5. Plain grinding, plunge, face, and shoulder grinding, grinding bars, taper grinding, using taper bushings, end plugs and arbors
6. Dressing grinding wheels

F. Production Control Department **290**

1. Learning general routine of the department
2. Following up on electrical, piping, or other work being done in the shop

G. Production Engineering Department **590**

1. Learning general routine of the department
2. Estimating time, materials, costs of jobs

H. Sales Department **430**

1. Learning the divisions and general routine of the department
2. Relating to customers in a professional, clear, and helpful way
3. Discussing their requirements with customers; learning the specifications and components of machines they need
4. Developing accurate quotations for in-house cost consideration

I. Blueprints, Technical Instructions, Layout **760**

1. Reading and understanding specifications
2. Reading and interpreting detail and assembly drawings and schematic drawings
3. Using list sheets and engineering orders pertaining to different orders or machines
4. Using assembly sequence write-ups and inspection sheets to insure proper techniques
5. Tracing and lettering
6. Making accurate drawings; showing detailing, tolerances, fit, finish dimensions
7. Making two-view and three-view drawings, sectional views
8. Changing existing drawings

J. Scraper and Hand Tools **330**

1. Using hand and power scrapers to fit sliding surfaces
2. Using straight edges, parallels, and surface plates to check surfaces and alignments
3. Using air drill and portable magnetic base drill to drill and ream as jobs require
4. Using tap wrenches and taps to thread holes
5. Learning difference of pipe taps, straight taps, coarse and fine threads, and their applications
6. Using scales, squares, micrometers, vernier caliper and indicators

7. Correctly using basic mechanic's tools such as: hammer, hack saw, box and open-end wrenches, scraper, files of various shapes and styles, tap wrenches, socket wrenches and torque wrenches

K. Sub-Assembly **1300**

1. Inspecting and testing parts and accessories
2. Positioning and aligning components, manually or using hoists
3. Fitting brackets and gears on shafts; different types of fit required in assembly of gear boxes.
4. Fitting brackets in line boxes and spindles
5. Fitting keys and keyways, dowel pins, bronze bushings in sub-assemblies
6. Riveting to fasten parts together
7. Using proper techniques for the assembly, pre-loading with checking of bearings, and exercising proper care when working with bearings
8. Inspecting and testing sub-assembly units after completion

L. Basic and Electric Hydraulics **490**

1. Bending tubing with assembly bending tools
2. Using correct procedure for fastening fittings on tubing
3. Identifying hydraulic pumps and valves using schematic drawings
4. Learning operation of hydraulic systems; troubleshooting problems

M. Welding **210**

1. Performing basic welding techniques on various steels
2. Knowing the different uses for various metals, such as: iron, steel, brass, bronze, aluminum, copper, etc.

N. Assembly Measurements **210**

1. Accurately using measuring devices, such as: electronic level, electric wire micrometer, spirit level, indicators, optical equipment, laser interferometer

O. Final Assembly and Testing **2100**

1. Performing final mechanical assembly operation on each category of machine manufactured by sponsor

2. Performing final electrical assembly operation on each category of machine manufactured by sponsor
3. Assisting in test running of machines; troubleshooting
4. Installing machines in customers' places of operation (if applicable)

Approximate 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 https://dol.ny.gov/public-work-and-prevailing-wage.

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APPENDIX B

RELATED INSTRUCTION

Safety and Health

1. OSHA 10-hour Safety Course for General Industry, or General Shop Safety
2. Proper Use of Personal Protective Equipment (PPE)
3. Machine Safety
4. Right-to-Know/Material Safety Data Sheets (MSDS)
5. Proper Lifting Techniques
6. First Aid – minimum 6.5 hours every 3 years

Blueprint Reading and Drawing

1. Reading and Interpreting Blueprints, Schematics, Drawings
2. Trade Drafting, including scales, dimensioning, types of lines, types of drawings, tolerances, common abbreviations and symbols, blueprint format, electrical schematics

Mathematics

1. Metrics
2. Use of Calculator
3. Use of Machinist's Handbook and Machinery Handbook
4. Arithmetic
5. Plane Geometry for the Trade
6. Trigonometry for the Trade
7. Precision Measurement

Trade Theory and Science

1. Tools and Equipment: Proper Care and Use
2. Materials of the Trade and Their Characteristics
3. Fundamentals of Metallurgy
4. Strength of Materials
5. Trade Terminology
6. Machine Tools and Other Machines: Proper Care and Operation
7. Fundamentals of Mechanics

8. Fundamentals of Hydraulics
9. Basic Electrical Circuits
10. Production Control, including: materials, personnel, records, flow charts, shipping schedules
11. Engineering, including: design, operation, materials, manufacturing methods, industrial standards, fabrication, transportation
12. Heat Treating (if applicable)
13. Testing: Destructive and Non-Destructive
14. Rigging, Signaling, Hoisting
15. Welding for the Trade
16. Layout: Rough, Semi-Precision, Precision
17. Millwright Principles, including: foundations, heavy equipment moving, anchoring, setting, electrical hookup, machinery installation codes (if applicable)

Other Workplace Skills

1. Oral Communication Skills
2. Customer Relations
3. Team Building Skills
4. Engineering and Manufacturing Economics
5. Time Management (optional)
6. Sexual Harassment Prevention Training – must comply with section 201-g of the Labor Law

A minimum of 144 hours of Related Instruction is required for each apprentice for each year.

Appendix B topics are approved by New York State Education Department.