

# Equipment List

## **Precision Machining Program(s) - Combined MFG and NIMS**

*\*Machinists Handbook*

### **Hand Tools for Bench Work:**

Air Compressor (stationary or portable)

C-clamps, parallel-closing clamps,

Clamps

Diagonal Cutter (optional)

Drills, portable power High Speed Drill Set

Bench vise and arbor press. four-inch

Edge finder,

Files and Rasps

→ Flat

→ Round

→ Half Round with handles

Layout ink or a Magic Marker,

Levels

Hammers; ball peen, and soft-faced hammers

Hacksaw frame with blades

Magnifying glass

Nut Driver Set (optional)

Pliers

→ Slip-joint

→ Long nose

→ Diagonal

Pop Rivetool & Assorted Pop Rivets (optional)

Pump Oiling Can

Punches; prick punch,

Reamer,

Sanders, orbital, disk (optional)

Saw, Band Vertical (blades)

Saw, Band, Metal Cutting, Horizontal, (blades)

Saw, 10" table with tilting arbor (blades)

Scrapers-assorted

Screw Pitch Gauges Inch/Metric

# Equipment List

## **Hand Tools for Bench Work (cont'd)**

Screwdrivers

- Flat head
- Phillips
- Jewelers

Scriber

Shop Vacuum

Sliding T bevel

Snips

Socket Set (preferred 3/8" set)

Squares, (e.g., tri, flat steel and combination)

Tap wrenches, tap and die set, standard/metric

Wrenches, combination, standard and metric sets, Hex Key

Assortment of boring bit set up to one inch dia.

Drill bits (3/8 drive)

Oily rags waste can

Cans, Solvent Dispensing

## **Safety**

First Aid Station or Kit

Flammable Liquid Storage Cabinet

Hearing Protection

Lockout/Tag Out devices

Protective Clothing (coveralls, aprons, sleeves, etc. as needed)

Respiratory Protection

Safety Cabinet (OSHA and EPA compliant)

Safety & Environmental Labels (Fire/Explosives Diamonds)

Safety Glasses, Goggles, and Face Shields

Steel Toe Shoes (Toe Caps)

Variety of Material Data Safety Sheets (MSDS)

Work Gloves

## **Measuring Instruments:**

Tape measures

Calipers, digital or dial

# Equipment List

## **Measuring Instruments (cont'd)**

Combination set Micrometers

- Depth
- Height
- Inside
- Outside 0-3 Micrometers (to .001")

Dial indicator (to .001" min resolution)

6" rule

Gages

- Go/no-go gage for threads
- Layout height gage
- Marking gauges,
- Pin gauges .244-.246
- Plug gage ¼-20
- Radius gages
- 6" dividers
- Small hole gage,
- Surface gage
- Layout height gage
- Pin gages. .123", .124", .125", .126", .127"
- ¼ - 20 UNC 2B plug gage
- Surface finish comparison gages
- Telescopic gages to .750

Squares

- Master Square
- Magnetic square
- Solid square

Surface finish comparison plates.

## **Consumables:**

Abrasives

Adhesives

Assortment of fasteners

Cutting Round Rods

- Alloy Free Aluminum
- Alloy Free Brass, Carbon, Steel rods

# Equipment List

## Tensile test samples

- Aluminum
- Brass
- Steel

## **Equipment**

- Sheet Metal Equipment
- Shear
- Adjustable Break
- Slip Roller-(optional)

## **Common workbench**

A layout surface plate at least 12" X 18"

## **Precision Machining Equipment**

**Please Note:** Equipment must allow user to perform operations of reaming, spot facing, countersinking, counterboring, and counterdrilling

### Drill Press

- Morse taper #3 spindle capacity or greater preferred
- The drill press must have a tapping capability or a tapping head accessory.

### 6" Drill Vise (or greater)

- Screws, studs, nuts, washers, and clamps sufficient to secure the vise, or the part
- Assorted parallels
- A composition hammer
- Assorted Morse taper sleeves fitted to the machine spindle
- Drill chucks
  - Drills
  - Reamers,
  - Countersinks
  - Spot facers
  - Counter bores
  - Center drills
  - Various taps

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## 6" Drill Vise (cont'd)

- Scriber
  - Layout ink
  - Pricks punch
  - Ball peen hammer
  - Angle plate
  - 6" dividers
  - Surface gage.

## Deburring Machine

## Polishing Machine

## Surface Grinders

- 8" or smaller diameter wheel with a suitable magnetic chuck
- Magnetic chuck
- Assorted parallels
- Angle plate or precision grinding vise
- Assorted clamps
- Composition hammer
- Assorted grinding wheels suitable for mounting to the spindle
- Files
- Magnetic base for indicators
- Surface gage of sufficient size
- Diamond dresser.

## Grinding Wheel Dresser

## **Lathe (Engine) of 14"X 30" (minimum capacity)**

**Please Note:** The lathe must have a quick change gear box with the threads pitch called for on the blueprint available from the gear box.

- Three-jaw universal scroll chuck, or a four-jaw independent chuck
- Tool post, right and left hand turning tools capable of turning to a square shoulder
- External threading tool matched to the profile of the thread called out on the turning blueprint
- Drill chuck
- Combination drill and countersink
- Drive dog
- Grooving/ parts tools
- 45° chamfer tools
- Live center, dead center fitted to the spindle taper
- Magnetic base for a dial indicator
- Files, wrenches as necessary.

# Equipment List

## **Boring Bar**

- Boring tool capable of boring to a square shoulder
- Drill chuck
- Center drill
- Assorted drills necessary to rough out the bore
- Magnetic base for a dial indicator
- Thread wires for chucks
- Files
- Wrenches as necessary.

Turning Machine (lathe) and its accessories

**Milling Machine** (Vertical) and its accessories

**Please Note:** To produce a part matching the blueprint specifications using appropriate trade techniques and speeds and feeds

- Table capacity of approximately 12"X36"
- 6" milling vise or greater
- Screws, studs, nuts, washers, and clamps sufficient to secure the vise, or the part to the table
- Assorted parallels
- Ball peen
- Soft-faced hammers
- Assorted cutters and cutter adapters fitted to the machine spindle
- Files
- Magnetic base for indicators
- Soft jaws for the vise
- Drill chuck
- Drills
- Reamers
- Combination drill and countersink or spotting drill
- Countersink
- Edge finder
- Coolants
- Cutting oil.
- Mill (CNC) with standard workbench with continuous path capability on 2½ axes.
- CNC lathe or turning center
- Computer workstation operator's manual

Equipment for Drafting/Blueprint reading portions of MFG

# Equipment List

## **Computer Equipment**

- Computers with sufficient memory and removable storage for drafting and virtual learning programs
- Peripherals and printers (minimum of 1 computer per 2 students)
- Minimum specifications:
  - DVD
  - CDRW
  - Color monitor
  - Surge Suppressers

## **Computer & Software Resources (optional)**

- Dimensional Calculations and Conversions software with manuals
- Computer Aided Design and Drafting (CADD) software/ SolidWorks
- Computer-Aided-Manufacturing (CAM) software-Mastercam / Gibbscam
- Data collection and analysis software (MS Excel, Minitab, LabVIEW)
- ERP/MRP software and manuals (Fourth Shift, Data Works)
- General productivity software, general utility software and Internet browsers
- Project Management software, with manuals
- Word processing software, with manuals (MS Office Pro XP Including Access/Excel/ PowerPoint/Word)
- Automated MFG/Manufacturing Execution Systems (MES) software and manuals
- Robotics and Materials Handling Software and manuals
- Plastics Technology software and manuals
- Rapid Prototyping software and manuals

## **Test and Measurement**

- Bore gauges
- Dividers
- Engineer scale
- Coordinate Measuring Machine (CMM) (**optional**)
- Granite Block
- Microscope