

**NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF MECHANICAL ENGINEERING**



**MANUFACTURING PROCESS
LABORATORY**

**Mechanical Engineering Program
Mechanical-Electrical Engineering Program
Mechatronics Engineering Program
Naval Engineering Program**

EQUIPMENT SPECIFIC SAFETY MANUAL

Lima, Peru

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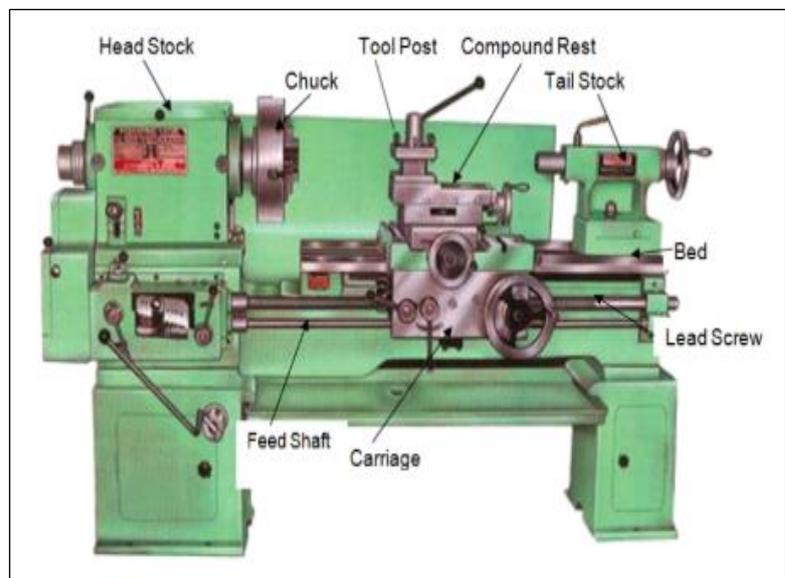
Machine Tools Laboratory

Equipment Specific Safety Manual

1. Lathe Machine

The following safe working practices need to be observed when working with manual lathes:

- Before using a lathe, turn off all power and perform the following functional and safety checks:
 - Make sure no cutting tools are mounted. Make sure the Compound Rest and Tool Post are mounted securely and all mounting screws are tightened.
 - Make sure all motion axes (Apron and Cross Slide) work smoothly and free of any obstruction by manually turning their spindles.
- Before powering up and turning on the machine
 - Make sure the spindle speed is set to a low RPM.
 - Make sure the feeds for Apron and Cross Slide are disengaged and set to low feed rates.
 - Make sure no work piece is mounted and the chuck key is removed.
- After successful completion of the above steps, turn on power and test all powered operations, such as Apron and Cross Slide feeds, and spindle rotation. Test the foot brake and emergency stop switches for proper function.
- Before mounting any stock or workpiece, turn off the power and remove any cutting tools that are mounted in the tool post.
- The work piece must be clamped securely in the chuck. Long workpieces must be supported with a rotating center mounted in the quill stock.
- Always remove chuck key from chuck immediately after use.
- Turn chuck or faceplate by hand before turning on the power to be sure there is no binding or clearance problems.
- Inspect cutting tools before use. Always use cutters which are sharp and in good condition. Do not use cutters that have shipped or broken out sections, or cracks.
- Always clamp the tool bit as short as possible in the tool holder to prevent it from breaking or chattering.
- Always make sure that the tool bit is centered and has the proper clearance and cutting angles. Ask for assistance making adjustments.



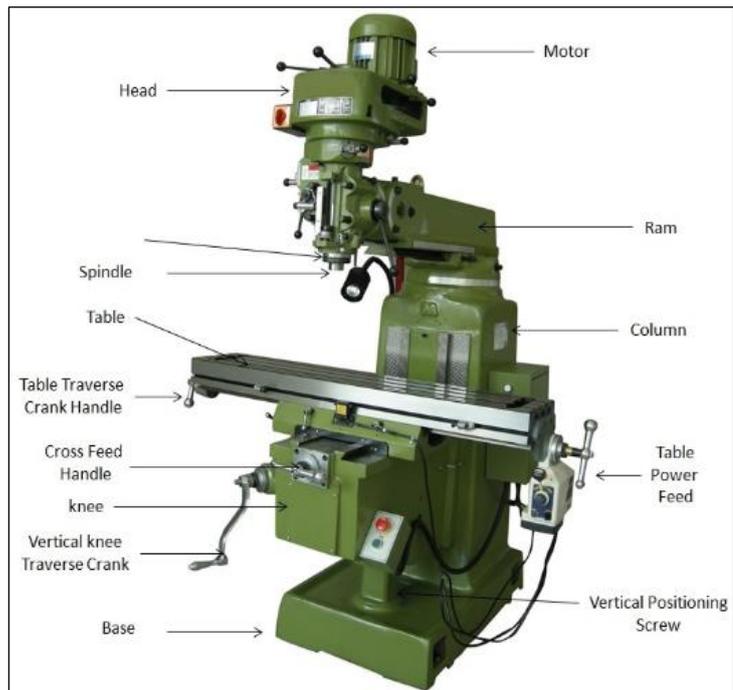
- Make sure the workpiece is rotating in the proper direction before cutting material.
- Never run the machine above the recommended cutting speed.
- Never feed the machine above the recommended feed rates.
- Don't take too heavy (deep) cuts.
- Always use the proper cutting fluid for the material being cut.
- Use an applicator brush to apply cutting fluid. Never use a rag or towel to apply cutting fluids while the machine is running!
- Never attempt to remove turnings or chips with your bare hands, no matter if the machine is running or stopped!
- Use a long brush to remove chips from the work piece. Never use a rag, towel or gloves to remove chips while the machine is running!
- Never put your hands onto the chuck, cutting tool or workpiece while the machine is running.
- Make sure that the machine is fully stopped before taking any measurements.
- Always stay at the machine while it is running.
- Make sure only one person operates the machine at any time.
- Don't place anything on the top of the headstock housing.
- Do not file on the lathe, unless you have a large amount of experience and have the shop manager's or supervisor's approval.
- If work is turned between centers, make sure that proper adjustment is made between centers and that the tailstock is locked in place.
- If work is being turned between centers and expands due to heat generated from cutting, readjust centers to avoid excessive friction.
- Before removing your work piece from the chuck turn off power and remove cutting tools from the tool post to avoid cutting yourself.
- Before cleaning the machine turn off the power and remove cutting tools from the tool post to avoid cutting yourself.

2. Milling Machine

The following safe working practices need to be observed when working with manual milling machines:

- Before using a manual milling machine, turn off all power and perform the following functional and safety checks:
 - Make sure no cutting tools are mounted. Make sure the vice is mounted securely and all vice mounting screws are tightened.
 - Make sure all motion axes work smoothly and free of any obstruction by manually turning their spindles.
 - Make sure all servo drives are turned off and set to their lowest speed.
- After successful completion of the above steps, turn on power and test all powered operations, such as x/y/z axis feeds and spindle rotation. Test the emergency stop switches for proper function.
- Before mounting any workpiece, remove any cutting tools that are mounted in the spindle. Work piece must be clamped securely in the vise or clamped securely to the table.

- Inspect cutting tools before use. Always use cutters which are sharp and in good condition. Do not use cutters that have chipped or broken out sections, or cracks.
- Make sure the spindle power is off and the spindle has come to a complete stop before changing cutters.
- Use gloves or a shop towel when inserting or removing cutting tools into the spindle to avoid cutting yourself.
- Make sure the cutter is rotating in the proper direction before cutting material.
- Never run the machine above the recommended cutting speed.
- If at all feasible, add a shield to prevent chips from hitting other people.
- Do not take heavy climb milling cuts on the shop's mills unless instructed to do so.
- Never feed the machine above the recommended feed rates.
- Don't take too heavy (deep) cuts.
- Always use the proper cutting fluid for the material being cut.
- Use an applicator brush to apply cutting fluid. Never use a rag or towel to apply cutting fluids while the machine is running!
- Use a long brush to remove chips from the work piece. Never use a rag, towel or gloves to remove chips while the machine is running!
- Never put your hands onto the cutting tool or workpiece while the machine is running.
- Make sure that the machine is fully stopped before taking any measurements.
- Always stay at the machine while it is running.
- Make sure only one person operates the machine at any time.
- Don't place anything on the milling machine table such as wrenches, hammers, or tools.
- Before removing your work piece from the vice or machine table remove cutting tools from the spindle to avoid cutting yourself.
- Before cleaning the machine turn off the power and remove cutting tools from the spindle to avoid cutting yourself.



3. Vertical Drill Press

The following safe working practices need to be observed when working with drill presses:

- Before mounting a work piece, make sure any drill tool is removed from the chuck in order to avoid potential injury.
- Securely mount your work piece in a vise, or clamp it to the drill table. NEVER hold it by hand!

- Always try to support part on parallels or a backing board when drilling through any material.
- When drilling hole-sizes larger than 5/16", it is advised to also secure the vise to the table by means of clamps.
- Especially brass, but also brittle plastics like Plexiglas can be difficult and dangerous to drill. Ask the shop supervisor for advice on drill and coolant selection when drilling these materials.
- Sheet metal can be difficult and dangerous to drill. Ask the shop supervisor for advice on drill when drilling sheet metal.
- Use a correctly ground drill bit for the material being drilled. Ask shop supervisor in case you are unsure which drill bit to use.
- Inspect drill bit before use. Always use drill bits which are sharp and in good condition. Do not use drill bits that have shipped or broken out sections.
- Always clean drill shank and/or drill sleeve, and the spindle hole before mounting.
- Never place taper shank tools such as large diameter drills or tapered shank reamers in a drill chuck. Only straight shank tools such as standard drills can be clamped in chucks or collets.
- Run drill at correct RPM for diameter of drill bit and material. Ask shop supervisor in case you are unsure which drilling speed applies.
- Use the proper cutting fluid for the material being drilled.
- Never remove chips with your bare hands, no matter if the machine is running or stopped!
- Use a long brush to remove chips from the work piece. Never use a rag, towel or gloves to remove chips while the machine is running!
- Don't drill with too much pressure.
- When drilling a deep hole withdraw the drill bit frequently to clear chips.
- If the drill binds in a hole, stop the machine and turn the spindle backwards by hand to release the bit.
- Ease up on drilling pressure as the drill starts to break through the bottom of the material.
- Let the spindle stop of its own accord after turning the power off. Never try to stop the spindle with your hand.
- Never clean the machine while it is in motion!
- If applicable, always remove the drill chuck key or the drill drift from the spindle immediately after using.

