

UW Physics Student Machine Shop

Standard Operating Procedures

Lathes

Purpose

Lathes are used to precisely cut round features on metal, plastic, and composite work pieces. With the appropriate tooling and fixtures, metal turning lathes can also produce concentric or eccentric features that are internal or external to the surface of the workpiece, including precision diameters, tapers, threads, chamfers, and grooves, both inside and outside.

Limitations

- The primary limitation of the lathe is that it can only cut round features. At the same time, the lathe excels at what it's built. If set-up and tooled correctly, a lathe can hold extremely close tolerances on size and geometry with little extra time or effort.
- The size of the lathe is also a key limiting factor. Most horizontal lathes are described by their "swing." This is the maximum diameter measured at the workpiece's outermost point of rotation. If this point reaches outside of the "swing" diameter (measured from centerline of rotation), it will crash, most likely into the precision-ground ways.
- Proper Tooling, Fixtures, and Accessories are a third key limiting factor on the lathe. A poorly-tooled lathe can produce only a small fraction of the variety, quality, run-time efficiency of a well-tooled lathe.

As always, whenever you have any doubt regarding the safe operation of Student Shop equipment, find the Shop Instructor or another Instrument Maker and ask before you act

Hazards

There are a number of particular hazards associated with the operation and use of tool, including but not limited to:

- Rotating components: Rotating components are found on the Chuck and other holding fixtures, the workpiece, and a variety of drive, transmission and feed shafts and handles, etc.
- Rotating components can result in accidental entanglement or worse with body parts, hair, loose jewelry, or clothing. Cutting tool and work piece Carriage and stationary lathe parts Carriage and rotating lathe parts or the work piece Feed cranks and stationary lathe parts • Pinch points and in-running nip points can cause bruising, crushing, and even amputation hazards, and can also offer additional entanglement hazards to clothing and other loose hanging materials.
- Cut and laceration hazards: • Sharp edges and burrs are frequently required or created when operating a lathe, creating risks of cuts and lacerations. These include handling of cutting tools and drill bits, on machined edges, on work pieces, on chips and cutoffs from work pieces, on Rotating/ moving long spiral “chips,”
- Lathe cutting creates the potential for objects to be thrown from the workpiece at high velocity, with a high risk of injury. Flying object hazards can be generated from improperly secured work pieces, improperly secured cutting tools, failure to remove the chuck key from the chuck before starting the lathe
- Burn hazards: Cutting metals and other materials at high speed on a lathe, even with cutting fluids or coolants, produces significant amounts of friction and heat. Components that may become very hot include: cutting chips- (be aware that some metal chips can themselves be fire hazards – consult the Safety Data Sheet for exotic or reactive metals, and review in advance with the shop instructor.)
- Chips that build up at the point of cut, wrap around the workpiece or fixture, or start to fill up the chip pan just below the workpiece and spindle area are all hazardous and all need to be cleaned away periodically when the machine is shut down. Even small amounts of sharp chips tangled around the spinning can cause instant amputation or mutilation. Large tangles, that seemed safely away, lying on the chip pan, can suddenly reemerge as they are grabbed into rotation by the smaller but growing tangles around chuck.
- Never stand in a direct line with workpiece rotation. Always stand a step or two to the right of the rotating of rotating workpiece.

Required Personal Protective Equipment (PPE)

- **Safety Glasses and/or Face Shield.** Eye protection should be worn at all times, including when handling or changing gear belts as well during saw operation.
- **Closed-toe, sturdy footwear.** Sturdy sneakers and other such footwear is the minimum level of allowable foot protection. Proper safety shoes or boots, with steel toes, electrical protections, etc. are preferred. Extremely lightweight sneakers and all sandals and flip-flops are not safe for machine shops in general.
- **Hearing protection is recommended in areas which exceed 85 decibels.** Higher decibel levels can cause permanent hearing loss very quickly so hearing protection is always recommended in machine shop.
- **If sufficient dust is created, a particle mask or respirator is advised.**
- **Hair ties, hats, etc. to safely contain long hair if needed**
- **Sturdy, well-covering and comfortable clothing WITH NO LOOSE SLEEVES, SCARVES, etc. that could get pinched and pulled through the lathe.**
- **ABSOLUTELY NO GLOVES ARE TO BE WORN WHILE THE MACHINE TOOL IS RUNNING.**

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