

Shop Safety Procedure

	Equipment/Task Name:	WOOD TURNING LATHE
	Equipment/Task Hazard Class:	4/5 http://ehs.yale.edu/forms-tools/tool-classification-matrix
	Shop Name:	
	Shop Hazard Class:	

Purpose

Wood turning lathes are typically used to shape wood into cylindrical profiles. Objects made on a wood lathe include such items as furniture legs, lamp posts, baseball bats, bowls and other ornamental forms. Wood lathe tooling consists of fixturing and securing devices for the work piece, a moveable tool rest, and hand-held cutting tools in the form of long handled gouges, skewers, scrapers, and parting tools. Specialty tooling is also available for internal shaping and surface development.

Although wood lathes can take many forms depending on the primary turning operation, those on campus include the driven or rotating headstock, lathe bed, tailstock for longer objects, and an adjustable tool rest.

Hazards

As with all shop tools, there are many potential hazards associated with the use of a wood turning lathe. Smaller benchtop wood lathes are Class 4 machines, while self-standing industrial sized wood lathe machines are Class 5 tools (<http://ehs.yale.edu/forms-tools/tool-classification-matrix>). There are a number of particular hazards associated with the operation and use of wood lathes.

Rotating or flying objects:

- Rotating components are found on the:
 - Spindle, tailpiece, and the turning work piece itself
- Rotating components can result in accidental entanglement or worse with body parts, hair, loose jewelry, or clothing.
- Turning operations pose significant risk of the work piece becoming dislodged while rotating and being thrown from the lathe causing serious injury to operator or bystanders.
- Large chips and wood pieces can be thrown from work pieces during turning operations.
- Special care must be used during initial roughing operations when the risk of work piece dislodgement is greatest.

Kickback:

- Separate from the potential for a work piece to be dislodged from the lathe is the potential for a tool being thrown from the operator's hands, with potential for serious operator or bystander injury.

Hazards (cont'd)

- Always stand to the side of the lathe and set lowest speed when rotating work pieces for the first time.
- Keep the tool rest close to the work piece and re-adjust as material is cut away and the gap widens.
- Immediately shut-down the lathe and stand to the side if the work piece starts to vibrate.

Airborne dust, chips, and splinters:

- Large accumulations of dust and chips must be removed to:
 - Allow clear workspace for operator
 - Reduce chance for slipping.
 - Reduce potential for fire or dust explosion hazards.

Pinchpoints / in-running nip points:

- Pinchpoints and in-running nip points can be found between the:
 - Lathe bed and the work piece, for large turning objects
 - Tool rest and the work piece
- Pinchpoints 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:

- Although generally less severe than on a metal lathe, wood cutting can generate some sharp edges and splinters depending upon nature of the wood.
- The actual cutting tools have sharp edges, creating risks of cuts and lacerations.

Burn hazards:

- Although more of an issue with metal lathes, cutting wood at high speed produces significant amounts of friction and heat. The user will generally see and smell this condition before it becomes a true fire hazard, but attention should be paid to the condition of the work piece throughout the cutting process and recognizing that the cutting tool itself will also be quite hot to the touch.

Limitations

Limitations:

Wood lathes are limited to the shaping of wooden work pieces, either as a solid piece of wood stock or one that has been glued up to create special visual off-sets and patterns. The size of the work piece is restricted by the physical geometry of the lathe and the available fixturing methods. Work piece length is limited by the distance between the driven spindle and the tailpiece, and width is limited by the chuck diameter and the centerline distance between the spindle and the lathe bed. Wood turned on a lathe must always be free from splits, knots, and voids. Pre-lathe preparation involves rough cutting on a band or tablesaw to reduce edges and bring the work piece into a roughly cylindrical profile.

Required Personal Protective Equipment

- Refer to the Shop Safety Postings and instructions provided by the Shop Supervisor.
- Faceshield or faceshield with safety glasses underneath

Shop specific required PPE:

Required Training

- Applicable Shop Rules
 - Student Shop Rules (<http://ehs.yale.edu/forms-tools/shop-rules-student-accessible-shops>)
 - Professional Shop Rules (<http://ehs.yale.edu/forms-tools/guidelines-professional-shops>)
- For Class 2 through 5 Student Shops, review and signing of the **Yale University Shop/Tool Use Safety Agreement** (<http://ehs.yale.edu/forms-tools/shoptool-use-safety-agreement>).

Required Training (cont'd)

- Shop Supervisors or Instructors must evaluate the tool user based on successful demonstration of the Training Competencies listed below as applicable.

Training Competencies:

- Understand the uses, limitation, and hazards of the wood turning lathe, including locations and use of all controls and machine E-stop methods.
- Dress appropriately and don correct personal protective equipment.
- Know how to inspect the wood lathe and setup for selected operation, with power shut-off.
- Show good judgment in work piece and wood lathe preparation and start-up process.
- Know how to determine proper placement of work pieces and secure as needed, using either spindle or faceplate methods.
- Be capable of effectively and safely performing turning operations, with all guards in place, including set-up, roughing, and final turning including finish sanding.
- Be able to correctly observe lathe operations and know when intervention is required and perform appropriate interventions including knowledge of emergency stopping procedure.

Shop specific training requirements:

Authorized Tool Users

Shop Supervisor, Shop Monitors and those authorized by shop supervision to operate the tool.

Tool Safety Rules

- Observe and follow all Yale Professional or Student Shop Rules as posted.
- Understand and follow manufacturer operating procedures.
- Inspect the tool for damage prior to use.
- Verify all guards are in place and adjusted properly.
- Do not bypass any safety devices.
- Always stay at the machine while it is running.
- Clean the tool after use.
- Report any malfunction or damage to the Shop Supervisor after tagging the tool "Out of Service, do not use".

Shop specific rules:

Proper Setup and Use

Prior to approaching the lathe you should have:

- Verified that the work piece is appropriate for use in the lathe.
- Prepared a drawing, plan, or worksheet as a guide to the work.
- Identified the operations that are intended for this work piece.
- Rough cut material to as close to final configuration as possible to minimize out of balance rotation and interrupted cutting. This will entail off lathe rough shaping using other instructor designated tools and techniques, typically a bandsaw or tablesaw.
- Reviewed your plans with the instructor, including means for mounting or fixturing the work piece using either the spindle or faceplate.
- Identified the appropriate settings for the material and intended operations.
- Prepared for tool use by verifying again that any loose clothing or jewelry has been removed or secured, and hair (including beards) tied back and away. Gloves should never be worn when working on a lathe.
- Donned personal protective equipment (faceshield or faceshield with safety glasses underneath).

Proper Setup and Use (cont'd)

Preparing the work piece:

- Determine proper setup/ configuration for turning.
- For spindle turning: *Cylindrical solid work pieces - wood grain direction lengthwise:*
 - Mark ends with center positions for spindle turning.
 - Sawcut drive grooves as appropriate in drive end of work piece, if necessary- it is recommended that safety style circular spindle drives be used whenever possible.
- For faceplate turning: *Work pieces to be hollowed out (bowl shaped objects):*
 - Direct attachment to faceplate
 - Gluing to sacrificial block which is attached to faceplate
 - Mount work piece to faceplate for faceplate turning.
 - Ensure that any sacrificial mounting blocks are securely glued to the final work piece prior to mounting.

At the wood lathe

- **Perform the following with the POWER OFF / E-STOP ENGAGED!**
- Secure workpiece in lathe:
 - Spindle turning:
 - Insert drive center into headstock- slide firmly into the taper so that it is securely seated.
 - Do likewise with the live center in the tailstock.
 - Slide the tailstock up just short of the length of the workpiece. Lock in place – support rough blank work piece and insert it into the drive center firmly. Then crank the tailstock up until it engages the other end of the of the work piece(be sure that it is on the center marks.
 - Rotate by hand to seat the drive center and live center in the workpiece. Lock quill on tailstock when workpiece is firmly seated.
 - Faceplate mounting / open turning:
 - Thread faceplate onto headstock and tighten holding headstock wheel and outer rim of faceplate.
 - If faceplate has locking setscrew, tighten it now.
- Adjust tool rest to be located just off the workpiece:
 - When first roughing the work piece, this will start out about 1/8" off the closest edge of the work piece when rotated by hand.
 - Tool rest will need to be adjusted frequently during roughing- ALWAYS STOP ROTATION BEFORE adjusting tool rest – and hand rotate before starting to ensure proper clearance to workpiece.
 - Height of tool rest should be adjusted so that the cutting edge of the tool is always cutting above the centerline of the workpiece. This will depend on the cutting tool used and technique- cutting tool should never be pointed "downhill."
- Discuss tool choices and planned technique with instructor before turning on the wood lathe.

Turning process

- Don personal protective equipment – full faceshield or faceshield with safety glasses , dust mask for dusty work, and hearing protection as required.
- Check work piece fixturing and tool rest position prior to start.
- With POWER OFF- Turn lathe speed control to lowest speed setting.
- **STAND TO THE SIDE OF MACHINE- DO NOT STAND IN FRONT OF WORK PIECE** as the work piece can fly out of the lathe and cause serious injury.
- Turn on power and start lathe
- Keep one hand on E-Stop and immediately stop machine if there is any vibration or wobble from the spinning work piece. Have instructor inspect setup and change / correct as needed.
- Adjust speed as appropriate for turning technique, work piece material and configuration.
 - Remember- the larger the work piece the SLOWER the required rotation speed for turning.

Proper Setup and Use (cont'd)

- Utilize tooling and techniques as developed with instructor-
 - Start cutting tool by slowly pivoting the cutting edge down into the workpiece.
 - Always cut above the centerline of the work piece.
 - Periodically stop lathe rotation and reposition tool rest to maintain ~ 1/8 " to ¼" distance between tool rest and work piece.
 - While machine is stopped, clean excess wood chips.

Completion:

- Stop the lathe with the On/Off/E-Stop. Do not touch any rotating parts. Await complete stop to rest before making measurements, removing work piece, tooling, or starting to clean-up.
- Move or remove the toolrest.
- Clear / vacuum bed and machine of all debris and scraps.
- Police area around lathe and remove any materials that do not belong there.
- Return tooling to proper storage area.
- Be sure to note any issues or problems with the laser and notify shop supervisor.

Finishing operations:

- Review finishing plans with instructor in advance.
- For open hand sanding on the lathe:
 - Tool rest must be removed
 - Run lathe at slowest speed
 - Recheck hands and arms for any loose clothing, sleeves, jewelry – **REMOVE**
 - Use small tri-folded pieces of sandpaper
 - Loosely hold with 2 fingers and thumb, apply light pressure to work piece as it is rotating.
 - Start with course grit and move to finer grits following instructor techniques.
 - Never try to grasp or grip the rotating work piece while finishing

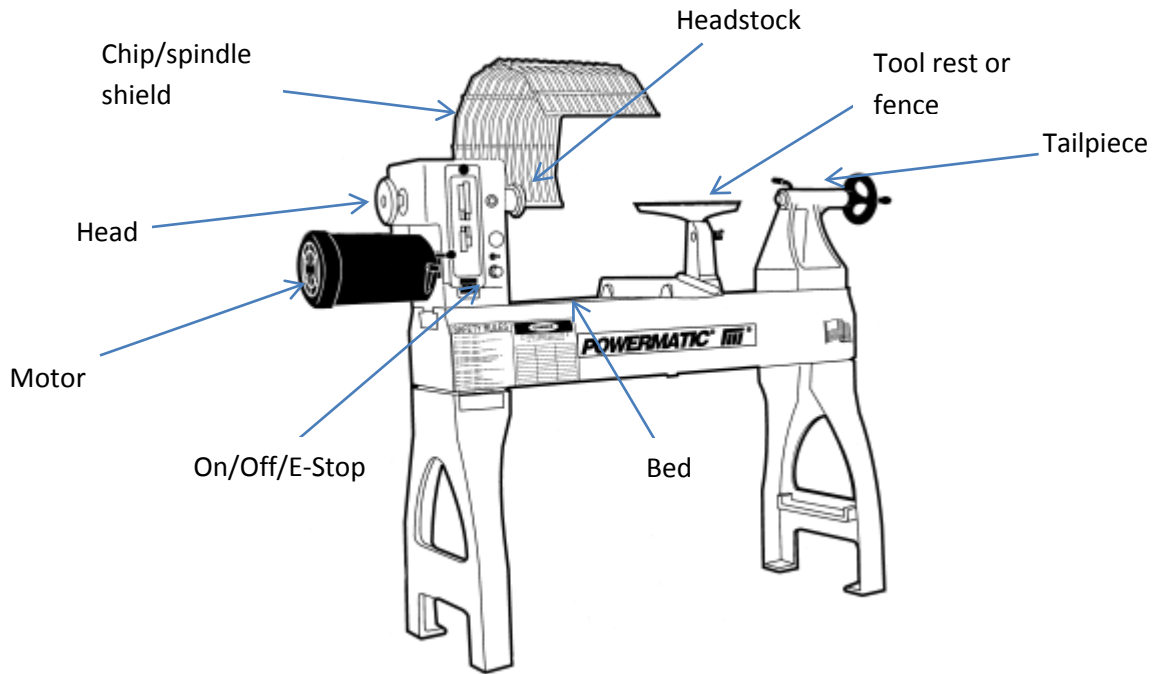
Shop specific procedures:

References and Tool-Specific Instructional Materials

Woodturning Guides: <http://www.woodworking.com/ww/SpecialtyWoodworking.aspx?specialty=4>

OSHA 3157 - Protecting Workers from Woodworking Hazards:
<https://www.osha.gov/Publications/osha3157.pdf>

Diagrams / Illustrations



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April 23, 2014

Suggestions, questions, or comments? Please contact your shop supervisor or EHS.