

# APPENDIX 1. MACHINE SHOP RISK ASSESSMENT

*This list is not all-inclusive. Not all hazards will apply to a particular machine. Always refer to the manufacturer's instruction manual for specific information.*

Hazard Class	1	2	3	4	5
<b>Power</b>	Low power hand/small bench tools (2-4 amp @ 120 VAC, <9V cordless)	Medium power tools (1/4 to 1/2 hp; <10 amp @120 VAC; 14-18V cordless; specialized enclosed NC- computer tools)	Powerful portable and small benchtop tools (<1/2 hp; 10-15 amps @ 120 VAC; 24-36V portable, pneumatics, hydraulics)	Light industrial tools (typically benchtop; >1/2 hp, pneumatics, hydraulics)	Large industrial tools (manual and NC-controlled)
<b>Common Examples</b>	<ul style="list-style-type: none"> <li>• Dremel tool</li> <li>• Cordless drill under 18V</li> <li>• Palm Sander</li> <li>• Soldering iron/gun</li> <li>• Heat gun</li> <li>• Hot melt glue gun</li> <li>• 3D printer (closed frame)</li> </ul>	<ul style="list-style-type: none"> <li>• Jig Saw</li> <li>• Corded devices &lt;1/3 hp</li> <li>• 18-24V cordless drill</li> <li>• Laser cutter/engraver</li> <li>• Thermal foam cutter</li> </ul>	<ul style="list-style-type: none"> <li>• Circular saw</li> <li>• Hand held belt sander</li> <li>• Framing nailer</li> <li>• ½ hp geared drill</li> <li>• Reciprocating saw</li> <li>• &gt;18V cordless tool</li> <li>• Chop/miter saw</li> <li>• Router</li> <li>• Mini-lathe</li> <li>• Angle grinder</li> <li>• Small press</li> </ul>	<ul style="list-style-type: none"> <li>• Small bandsaw</li> <li>• Small drill press</li> <li>• Small/benchtop milling machine</li> <li>• Small/benchtop lathe</li> <li>• Belt/disc sander</li> <li>• Horizontal saw</li> <li>• Scroll saw</li> <li>• Sewing machine</li> <li>• Planer/jointer</li> <li>• Bench grinder</li> <li>• SawStop style tablesaw</li> </ul>	<ul style="list-style-type: none"> <li>• Full sized milling machine</li> <li>• Full sized metal lathe</li> <li>• Table saw (non-SawStop)</li> <li>• Radial arm saw</li> <li>• Large drill press</li> <li>• Large band saw</li> <li>• Surface grinder</li> <li>• Large jointer/planer</li> <li>• Shaper/moulder</li> <li>• Power shear</li> <li>• Industrial press</li> </ul>
<b>Potential Injuries</b>	Cuts Eye injuries Abrasions Minor burns Minor struck-by flying objects Electric shock	<i>As for Class 1, plus:</i> Lacerations Punctures Minor crushing injuries	<i>As for Class 2, plus:</i> Severe bleeding Minor amputations Minor entanglement	<i>As for Class 3, plus:</i> Entanglement	<i>As for Class 4, plus:</i> Immediately life threatening injury or death
<b>Potential Severity</b>	Low: First Aid	Medium: First Aid or minor injury; requiring emergency room visit	High: Immediate emergency room visit; Permanent disability of disfigurement	Highest: Serious injury or death	

Task	Hazard	Danger Zone	Risk Reduction Methods
Workpiece clamping	Crushing	Between fixed and moving part including work clamping (chuck or tailstock) and tool magazine	<p><u>Safeguarding:</u>  <i>Guards:</i> Fixed, interlocked, adjustable, moveable  <i>Devices:</i> Movable barrier devices; Light curtains/beam device; Two-hand operating lever, trip and control device; Safety mat device  <i>Awareness:</i> Barriers; Signals; Safety signs  <i>Other measures:</i> Safe-distance guarding</p> <p><u>Equipment:</u>  Emergency Stop device (palm or push button)  Safety blocks, locking pins or limiting pins  Slide locks  Work holding equipment  Process malfunction, detection &amp; monitoring equipment  Safety interface/relay modules  Shields  Enabling devices  Hold-to-run controls  Measures for isolation and energy dissipation</p> <p><u>Information and Training:</u>  Signage  Instruction Operating  Manuals Safe Work  Procedures Supervision  Permit-to-work system  Personal Protective Equipment</p>
Whipping bar stock	Crushing	Either end of spindle	
Moving axis	Shearing	Between tool/spindle and table	
Spindle or tool running or cutting	Cutting or severing	At spindle or tool	
Part feeding	Entanglement	By moving part including bar feed and tool magazine	
Rapid travel of table or spindle head	Drawing in or trapping	Envelope of movement of workpiece on table axes or tool in spindle head	
Moving or rotating tool	Impact	At spindle or tool	
	Stabbing or puncture	At sharp tool faces	
Maintenance or repair	Electrical contact (direct or indirect)	Direct or indirect contact with normally live parts	
	Crushing	Near moving parts	
	Cutting	Electrical noise	
	Trapping	Electrostatic discharge	
		Arc flash hazard	
		Improper wiring or grounding	
		Liquid or wet locations	
		Overvoltage or overcurrent	
		Insulation failure (vibration or thermal cycling)	
Control system failure: Modification of control system Defect or failure of one or several components of the control system Variation or failure in power supply to control system Inappropriate selection, design or location or control devices	Crushing	Dropping or ejection of a mobile part of the machine or of a workpiece clamped by the machine	
	Shearing		
	Cutting	Failure to stop moving parts	
	Severing	Machine action resulting from defeating or failure of safeguarding devices	
	Entanglement	Uncontrolled speed change	
	Trapping	Unintended or unexpected start-up	
	Impact		
	Puncture		
	Electrical contact		

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*Based on Yale EH&S Student Shop Safety Policies & Procedures, ANSI B11.0 and B11.6*