

### Machine Safeguarding and Controls

Tool Type	Size/Style	Power	Potential Hazards	Emergency Stopping and Power Controls	Shields and Guards	Other Protective Measures
Band Saw / Small	Bench	Electric	<ul style="list-style-type: none"> <li>• Cutting blade – lacerations</li> <li>• Rotating blade pulleys – pinch points, entanglement</li> <li>• Flying objects – eye, face, skin injuries</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart for wood</li> </ul>	<ul style="list-style-type: none"> <li>• Blade</li> <li>• Covered pulleys</li> </ul>	<ul style="list-style-type: none"> <li>• Push sticks</li> <li>• Fence</li> </ul>
Band Saw / Large	Standing	Electric	<ul style="list-style-type: none"> <li>• Cutting blade – lacerations, amputation</li> <li>• Rotating blade pulleys – pinch points, entanglement</li> <li>• Flying objects – eye, face, skin injuries</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart for wood</li> </ul>	<ul style="list-style-type: none"> <li>• Blade plus extension if needed</li> <li>• Fully encased band saw wheels</li> </ul>	<ul style="list-style-type: none"> <li>• Smallest opening in work surface possible</li> </ul>
Brake, Metal Bending	Bench or Standing	Manual	<ul style="list-style-type: none"> <li>• Caught between – finger crushing</li> </ul>			<ul style="list-style-type: none"> <li>• Awareness Barrier</li> <li>• Interlocked Barrier Guards</li> </ul>
Drill Grinder/Sharpener	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Rotating shaft and wheel – pinch points, abrasions</li> <li>• Flying objects – eye, face, skin injuries</li> <li>• Heat / sparks – burns, fire</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> </ul>	<ul style="list-style-type: none"> <li>• Wheel</li> <li>• Chip shield as feasible</li> </ul>	<ul style="list-style-type: none"> <li>• Bit vise / clamp</li> <li>• Faceshield if excessive flying objects expected</li> </ul>
Drill Press / Small	Bench	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting bit – minor lacerations, punctures</li> <li>• Rotating chuck and bit – entanglement</li> <li>• Flying objects – from parts working or centrifugal throw (chuck key, part) – eye, face, skin injuries</li> <li>• Torque exerted on work piece – impact injuries</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart for wood</li> </ul>	<ul style="list-style-type: none"> <li>• Covered pulley head</li> <li>• Portable chuck / chip</li> <li>• Rear shielding as needed</li> </ul>	<ul style="list-style-type: none"> <li>• Vise – secured</li> <li>• Spring-loaded chuck key</li> <li>• Work / tool rest</li> </ul>

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Drill Press / Large	Standing	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting bit – minor lacerations, punctures</li> <li>• Rotating chuck and bit –entanglement</li> <li>• Flying objects – from parts working or centrifugal throw (chuck key, part) – eye, face, skin injuries</li> <li>• Higher torque on work piece – impact injuries</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart for wood</li> </ul>	<ul style="list-style-type: none"> <li>• Covered pulley head</li> <li>• Affixed multi-plane chuck/chip</li> <li>• Rear shielding as needed</li> </ul>	<ul style="list-style-type: none"> <li>• Vise – secured</li> <li>• Spring-loaded chuck key</li> <li>• Hearing protection for high pitch metal cutting</li> </ul>
Grinder (hard wheels)	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Rotating shaft and wheel – pinch points, abrasions</li> <li>• Flying objects – parts or wheel shatter - eye, face, skin injuries</li> <li>• Heat / sparks - burns, fire</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> </ul>	<ul style="list-style-type: none"> <li>• Wheel enclosure</li> <li>• Upper tongue</li> <li>• Chip shield</li> <li>• Rear shielding as needed</li> </ul>	<ul style="list-style-type: none"> <li>• Work / tool rest</li> <li>• Warning label with gap tolerances</li> <li>• Depth / feeler gauge</li> <li>• Faceshield as needed</li> </ul>
Jig and Scroll Saws	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting blade - lacerations</li> <li>• Flying objects – eye, face, skin injuries</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart for wood</li> </ul>	<ul style="list-style-type: none"> <li>• Blade</li> </ul>	<ul style="list-style-type: none"> <li>• Faceshield if excessive flying objects expected</li> </ul>
Jointer	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting heads – serious lacerations, amputation</li> <li>• Rotating parts –entanglement</li> <li>• Flying objects – eye, face, skin injuries</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart for wood</li> </ul>	<ul style="list-style-type: none"> <li>• Cutter shield</li> </ul>	<ul style="list-style-type: none"> <li>• Push sticks and blocks</li> </ul>
Laser Cutter	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Laser – ocular injury, burns</li> <li>• Heat - burns, fire</li> <li>• Moving laser head – physical injuries</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop</li> <li>• Anti-restart</li> <li>• Key or cord access</li> </ul>	<ul style="list-style-type: none"> <li>• Interlocked cover / access</li> </ul>	<ul style="list-style-type: none"> <li>• Local exhaust</li> </ul>

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Lathe - Wood	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Rotating parts – serious entanglement</li> <li>• Flying objects – from parts working or centrifugal throw (chuck key, part) – eye, face, skin injuries</li> <li>• Sharp cutting tools - lacerations</li> <li>• Pinch points – crushing, bruising</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart</li> </ul>	<ul style="list-style-type: none"> <li>• Chuck</li> <li>• Workpiece / point of operation</li> </ul>	<ul style="list-style-type: none"> <li>• Tool rest</li> <li>• Faceshield if point of operation shield not possible</li> </ul>
Lathe – Metal	Mini Bench	Electric	<ul style="list-style-type: none"> <li>• Rotating parts – entanglement</li> <li>• Flying objects – eye, face, skin injuries</li> <li>• Sharp cutting tools - lacerations</li> <li>• Pinch points – minor crushing, bruising</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> </ul>	<ul style="list-style-type: none"> <li>• Portable shield</li> </ul>	<ul style="list-style-type: none"> <li>• Tool rest</li> <li>• Faceshield if point of operation shield not possible</li> </ul>
Lathe – Metal	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Rotating parts – serious entanglement</li> <li>• Flying objects – from parts working or centrifugal throw (chuck key, part) – eye, face, skin injuries</li> <li>• Sharp cutting tools - lacerations</li> <li>• Pinch points – crushing, bruising</li> <li>Heat - Burns</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Emergency foot brake / power stop (geared by factory new equipment – required for student shops)</li> <li>☑ Anti-restart</li> </ul>	<ul style="list-style-type: none"> <li>• Fixed or portable chuck shield</li> <li>• Cross-slide shield</li> <li>• Lead screw if exposed</li> <li>☑ Bar feeder cover (if present)</li> <li>☑ Rear shield as needed</li> </ul>	<ul style="list-style-type: none"> <li>• Spring-loaded chuck wrenches</li> <li>• Protect collet release handle if exposed</li> </ul>
Metal Cutting Saw – Horizontal	Standing	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting blade – lacerations, amputation</li> <li>• Rotating blade pulley – entanglement, pinch point</li> <li>• Flying objects – eye, face, skin injuries</li> <li>• Heat / sparks – burns, fire</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> </ul>	<ul style="list-style-type: none"> <li>• Blade guard, upper and lower</li> <li>• Wheel / pulley guards</li> </ul>	<ul style="list-style-type: none"> <li>• Work piece vise / clamp</li> </ul>

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Milling Machine	Standing	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting bit – minor lacerations, punctures</li> <li>• Rotating chuck and bit –entanglement</li> <li>• Flying objects – from parts working or centrifugal throw (chuck key, part) – eye, face, skin injuries</li> <li>• Higher torque exerted on work piece – impact injuries</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart</li> </ul>	<ul style="list-style-type: none"> <li>• Affixed multi-plane chuck/chip</li> <li>• Drive belt covers</li> <li>• Rear / side shielding as needed</li> </ul>	<ul style="list-style-type: none"> <li>• Spring-loaded chuck wrenches (if used)</li> <li>• Vise – secured</li> <li>• Retractable handles on powered tables</li> </ul>
Planer	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting heads – serious lacerations, amputations</li> <li>• Rotating (horiz.) parts –entanglement</li> <li>• Flying objects – eye, face, skin injuries</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop</li> <li>• Anti-restart for wood</li> </ul>	<ul style="list-style-type: none"> <li>• Adjustable entry / feed</li> <li>• Cutting head</li> </ul>	<ul style="list-style-type: none"> <li>• Push sticks</li> <li>• Outfeed support</li> <li>• Hearing protection for high noise planing</li> </ul>
Press	Bench or Standing	Manual	<ul style="list-style-type: none"> <li>• Caught between – crushing</li> <li>• Flying objects – eye, face, skin injuries</li> </ul>		<ul style="list-style-type: none"> <li>• Portable shield or cage for potential shattering object</li> </ul>	<ul style="list-style-type: none"> <li>• Warning label</li> </ul>
Printing Press	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Rotating parts, pulleys, wheels - entanglement</li> <li>• Caught between - crushing</li> <li>• Possible flying objects – eye, face, skin injuries</li> <li>• Pinch points – crushing, bruising</li> <li>• Ink and cleaning solvents - chemicals</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart</li> </ul>	<ul style="list-style-type: none"> <li>• Pulley(s)</li> <li>• Feeds</li> <li>• Rollers</li> </ul>	<ul style="list-style-type: none"> <li>• Gloves (nitrile exam) for incidental chemical handling and cleaning</li> <li>• Chemical substitution</li> </ul>

Tool Type	Size/Style	Power	Potential Hazards	Emergency Stopping and Power Controls	Shields and Guards	Other Protective Measures
Radial Arm Saw	Bench	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting blade – serious lacerations and amputations</li> <li>• Flying objects – eye, face, skin injuries</li> <li>• Rotating shaft / blade –entanglement</li> </ul>	<ul style="list-style-type: none"> <li>• Finger /constant pressure switch, E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart</li> </ul>	<ul style="list-style-type: none"> <li>• Top enclosed blade cover</li> <li>• Blade (self-adjusting)</li> </ul>	<ul style="list-style-type: none"> <li>• Auto-retraction</li> <li>• Fence (kerfed to avoid restricting blade guard)</li> <li>• Clamps</li> <li>• Faceshield if excessive flying objects expected</li> </ul>
Sander, Belt (vertical or horizontal)	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Flying objects – eye, face, skin injuries</li> <li>• Rotating pulleys, belts - entanglement</li> <li>• Pinch points – crushing, bruising</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart</li> </ul>	<ul style="list-style-type: none"> <li>• Pulleys</li> <li>• Rollers (both sides)</li> <li>• Area below tool rest</li> </ul>	<ul style="list-style-type: none"> <li>• Tool rest</li> </ul>
Sander, Disc	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Flying objects – eye, face, skin injuries</li> <li>• Rotating pulleys, belts - entanglement</li> <li>• Pinch points – crushing, bruising</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart for wood</li> </ul>	<ul style="list-style-type: none"> <li>• Pulleys</li> <li>• Side</li> </ul>	<ul style="list-style-type: none"> <li>• Tool rest</li> </ul>
Saw, Cut-Off (abrasive disc and metal cutting)	Bench	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting blade – lacerations, amputations</li> <li>• Rotating blade –entanglement</li> <li>• Flying objects – eye, face, skin injuries</li> <li>• Heat / sparks – burns, fire</li> </ul>	<ul style="list-style-type: none"> <li>• Finger / constant pressure switch</li> </ul>	<ul style="list-style-type: none"> <li>• Blade (self-adjusting)</li> </ul>	<ul style="list-style-type: none"> <li>• Auto-return to upright</li> <li>• Fence</li> <li>• Vise – bolted / clamped</li> <li>• Clamps</li> </ul>
Saw, Miter / Compound Miter Chop-Style Saw	Bench	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting blade – lacerations, amputations</li> <li>• Rotating blade –entanglement</li> <li>• Flying objects – eye, face, skin injuries</li> <li>• Heat / sparks – burns, fire</li> </ul>	<ul style="list-style-type: none"> <li>• Finger / constant pressure switch</li> </ul>	<ul style="list-style-type: none"> <li>• Blade (self-adjusting)</li> </ul>	<ul style="list-style-type: none"> <li>• Auto-return to upright</li> <li>• Fence</li> <li>• Clamps</li> <li>• Laser sighted cut</li> </ul>

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Saw, Upright Panel Style	Standing	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting blade – lacerations, amputations</li> <li>• Rotating blade –entanglement</li> <li>• Flying objects – eye, face, skin injuries</li> <li>• Heat / sparks – burns, fire</li> </ul>	<ul style="list-style-type: none"> <li>• Finger / constant pressure switch</li> </ul>	<ul style="list-style-type: none"> <li>• Blade (self-adjusting)</li> </ul>	<ul style="list-style-type: none"> <li>• Auto-return</li> <li>• Fence</li> <li>• Clamps</li> </ul>
Saw, Wet Abrasive	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting blade – lacerations, amputations</li> <li>• Rotating blade –entanglement</li> <li>• Flying objects – eye, face, skin injuries</li> <li>• Heat / sparks – burns, fire</li> <li>• Water / electrical – shock</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> </ul>	<ul style="list-style-type: none"> <li>• Blade</li> </ul>	<ul style="list-style-type: none"> <li>• GFCI outlet / plug adapter</li> <li>• Fence</li> <li>• Clamps</li> <li>• Faceshield as needed</li> </ul>
Shaper / Inverted Router (Table)	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting tool – lacerations, amputation</li> <li>• Rotating tool –entanglement</li> <li>• Flying objects – eye, face, skin injuries</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart for wood</li> </ul>	<ul style="list-style-type: none"> <li>• Cutting tool guard</li> </ul>	<ul style="list-style-type: none"> <li>• Fence</li> <li>• Pushsticks</li> </ul>
Shear / Cutter	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting blade – serious lacerations, amputations</li> <li>• Caught between – crushing</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop or foot switch</li> <li>• Anti-restart</li> </ul>	<ul style="list-style-type: none"> <li>• Blade and hold down guard</li> <li>• Rear access prevention</li> </ul>	<ul style="list-style-type: none"> <li>• 2-hand controls as interim</li> </ul>
Table Saw	Standing	Electric	<ul style="list-style-type: none"> <li>• Sharp cutting blade – serious lacerations or amputation</li> <li>• Rotating blade –entanglement</li> <li>• Flying objects – eye, face, skin injuries</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> <li>• Anti-restart for wood</li> <li>☑ SawStop required for student shops</li> </ul>	<ul style="list-style-type: none"> <li>• Blade (self-adjusting)</li> </ul>	<ul style="list-style-type: none"> <li>• Fence and miter</li> <li>• Splitter / riving knife</li> <li>• Anti-kickback pawls</li> <li>• Pushsticks</li> <li>• Featherboards / jigs</li> </ul>
Water Jet Cutter	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• High pressure water – lacerations</li> <li>• Moving spray head(s) – physical injuries</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop</li> <li>• Anti-restart</li> <li>• Key or code access</li> </ul>	<ul style="list-style-type: none"> <li>• Interlocked cover / access</li> </ul>	<ul style="list-style-type: none"> <li>• GFCI outlet / plug adapter</li> </ul>

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Wire Wheel	Bench or Standing	Electric	<ul style="list-style-type: none"> <li>• Rotating shafts and wheels – abrasions, lacerations, entanglement</li> <li>• Flying objects – eye, face, skin injuries</li> <li>• Pinch points – crushing, bruising</li> <li>• Heat / sparks - burns, fire</li> </ul>	<ul style="list-style-type: none"> <li>• E-stop, accessible single action hand switch, or foot switch</li> </ul>	<ul style="list-style-type: none"> <li>• Wheel enclosure as feasible</li> </ul>	<ul style="list-style-type: none"> <li>• Tool rest if needed</li> <li>• Clamps for holding small parts</li> <li>• Faceshield if excessive flying objects expected</li> </ul>