

Yale Practices for Tool Safeguarding and Controls¹

26 June 2015

Tool Type	Size/Style	Power	Potential Hazards	Emergency Stopping and Power Controls ²	Shields and Guards	Other Protective Measures
Arbor Press	Bench or Standing	Manual	<ul style="list-style-type: none"> • Caught between – crushing, limited by manual operation 			<ul style="list-style-type: none"> • Warning label
Band Saw / Small	Bench	Electric	<ul style="list-style-type: none"> • Cutting blade – lacerations • Rotating blade pulleys – pinch points, entanglement • Flying objects – eye, face, skin injuries 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Anti-restart for wood 	<ul style="list-style-type: none"> • Blade • Covered pulleys 	<ul style="list-style-type: none"> • Push sticks • Fence
Band Saw / Large	Standing	Electric	<ul style="list-style-type: none"> • Cutting blade – lacerations, amputation • Rotating blade pulleys – pinch points, entanglement • Flying objects – eye, face, skin injuries 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Anti-restart for wood 	<ul style="list-style-type: none"> • Blade plus extension if needed • Fully encased band saw wheels 	<ul style="list-style-type: none"> • Smallest opening in work surface possible
Bead / Shot Blaster (w/ Glove box)	Bench	Electric	<ul style="list-style-type: none"> • Abrasive shot – skin irritation, abrasion • Rotating / moving parts – blade in fan motor • Flying objects – eye, face, skin injuries 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Door interlocks for large units 		
Brake, Metal Bending	Bench or Standing	Manual	<ul style="list-style-type: none"> • Caught between – finger crushing 			
Buffer, Wheel	Bench or Standing	Electric	<ul style="list-style-type: none"> • Rotating parts – entanglement • Flying objects – eye, face, skin injuries • Parts pulled / thrown from hand – flying objects 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch 	<ul style="list-style-type: none"> • Rotating shaft and nut guards as feasible 	<ul style="list-style-type: none"> • Clamps for small parts • Faceshield if excessive flying objects expected
Cutting Block	Bench	Manual	<ul style="list-style-type: none"> • Cutting blades – lacerations, amputation 			
Die Filer	Bench or Standing	Electric	<ul style="list-style-type: none"> • Vertical oscillating shaft – minor punctures • Possible flying objects – eye, face, skin injuries 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch 	<ul style="list-style-type: none"> • Chip shield as feasible 	<ul style="list-style-type: none"> • Bit vise / clamp • Faceshield if excessive flying objects expected

¹ For all tools: Bench models affixed with bolts / clamps; standing / pedestal models bolted / secured to floor (except high mass units such as mills and lathes)
 After-market E-stop placement at critical operator locations, installed in consultation with shop manager
 Tool lights protected by covers or safety coated bulbs; low voltage (< 24 V) preferred
 Safety glasses / goggles worn for all tools inside shop proper; no loose clothing, jewelry, or hair
 All tool use limited to approved / qualified personnel only

² Anti-restart: Required by OSHA for woodworking tools (Yale best practices - for all tools where accidental re-start would likely be unnoticed and pose risk of injury; also all new tools as available)

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Drill Grinder/Sharpener	Bench or Standing	Electric	<ul style="list-style-type: none"> Rotating shaft and wheel – pinch points, abrasions Flying objects – eye, face, skin injuries Heat / sparks – burns, fire 	<ul style="list-style-type: none"> E-stop, accessible single action hand switch, or foot switch 	<ul style="list-style-type: none"> Wheel Chip shield as feasible 	<ul style="list-style-type: none"> Bit vise / clamp Faceshield if excessive flying objects expected
Drill Press / Small	Bench	Electric	<ul style="list-style-type: none"> Sharp cutting bit – minor lacerations, punctures Rotating chuck and bit –entanglement Flying objects – from parts working or centrifugal throw (chuck key, part) – eye, face, skin injuries Torque exerted on work piece – impact injuries 	<ul style="list-style-type: none"> E-stop, accessible single action hand switch, or foot switch Anti-restart for wood 	<ul style="list-style-type: none"> Covered pulley head Portable chuck / chip Rear shielding as needed 	<ul style="list-style-type: none"> Vise – secured Spring-loaded chuck key Work / tool rest
Drill Press / Large	Standing	Electric	<ul style="list-style-type: none"> Sharp cutting bit – minor lacerations, punctures Rotating chuck and bit –entanglement Flying objects – from parts working or centrifugal throw (chuck key, part) – eye, face, skin injuries Higher torque on work piece – impact injuries 	<ul style="list-style-type: none"> E-stop, accessible single action hand switch, or foot switch Anti-restart for wood 	<ul style="list-style-type: none"> Covered pulley head Affixed multi-plane chuck/chip Rear shielding as needed 	<ul style="list-style-type: none"> Vise – secured Spring-loaded chuck key Hearing protection for high pitch metal cutting
Foam Cutter	Bench or Standing	Electric	<ul style="list-style-type: none"> Hot wire – burns, fire Smoke – inhalation exposure 	<ul style="list-style-type: none"> E-stop Anti-restart Key or code access 	<ul style="list-style-type: none"> Interlocked cover / access 	<ul style="list-style-type: none"> Local exhaust
Grinder (hard wheels)	Bench or Standing	Electric	<ul style="list-style-type: none"> Rotating shaft and wheel – pinch points, abrasions Flying objects – parts or wheel shatter - eye, face, skin injuries Heat / sparks - burns, fire 	<ul style="list-style-type: none"> E-stop, accessible single action hand switch, or foot switch 	<ul style="list-style-type: none"> Wheel enclosure Upper tongue Chip shield Rear shielding as needed 	<ul style="list-style-type: none"> Work / tool rest Warning label with gap tolerances Depth / feeler gauge Faceshield as needed

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Jig and Scroll Saws	Bench or Standing	Electric	<ul style="list-style-type: none"> • Sharp cutting blade - lacerations • Flying objects – eye, face, skin injuries 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Anti-restart for wood 	<ul style="list-style-type: none"> • Blade 	<ul style="list-style-type: none"> • Faceshield if excessive flying objects expected
Jointer	Bench or Standing	Electric	<ul style="list-style-type: none"> • Sharp cutting heads – serious lacerations, amputation • Rotating (horiz.) parts –entanglement • Flying objects – eye, face, skin injuries 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Anti-restart for wood 	<ul style="list-style-type: none"> • Cutter shield 	<ul style="list-style-type: none"> • Push sticks and blocks
Laser Cutter	Bench or Standing	Electric	<ul style="list-style-type: none"> • Laser – ocular injury, burns • Heat - burns, fire • Moving laser head – physical injuries 	<ul style="list-style-type: none"> • E-stop • Anti-restart • Key or cord access 	<ul style="list-style-type: none"> • Interlocked cover / access 	<ul style="list-style-type: none"> • Local exhaust
Lathe - Wood	Bench or Standing	Electric	<ul style="list-style-type: none"> • Rotating parts – serious entanglement • Flying objects – from parts working or centrifugal throw (chuck key, part) – eye, face, skin injuries • Sharp cutting tools - lacerations • Pinch points – crushing, bruising 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Anti-restart 	<ul style="list-style-type: none"> • Chuck • Workpiece / point of operation 	<ul style="list-style-type: none"> • Tool rest • Faceshield if point of operation shield not possible
Lathe – Metal	Mini Bench	Electric	<ul style="list-style-type: none"> • Rotating parts – entanglement • Flying objects – eye, face, skin injuries • Sharp cutting tools - lacerations • Pinch points – minor crushing, bruising 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch 	<ul style="list-style-type: none"> • Portable shield 	
Lathe – Metal	Bench or Standing	Electric	<ul style="list-style-type: none"> • Rotating parts – serious entanglement • Flying objects – from parts working or centrifugal throw (chuck key, part) – eye, face, skin injuries • Sharp cutting tools - lacerations • Pinch points – crushing, bruising 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Emergency foot brake / power stop (geared by factory new equipment 	<ul style="list-style-type: none"> • Fixed or portable chuck shield • Cross-slide shield • Lead screw if 	<ul style="list-style-type: none"> • Spring-loaded chuck wrenches • Protect collet release handle if exposed

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Lathe – Metal (cont'd)			<ul style="list-style-type: none"> • Heat – burns 	<ul style="list-style-type: none"> – required for student shops) • Anti-restart 	<ul style="list-style-type: none"> exposed • Bar feeder cover (if present) • Rear shield as needed 	
Metal Cutting Saw – Horizontal	Standing	Electric	<ul style="list-style-type: none"> • Sharp cutting blade – lacerations, amputation • Rotating blade pulley – entanglement, pinch point • Flying objects – eye, face, skin injuries • Heat / sparks – burns, fire 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch 	<ul style="list-style-type: none"> • Blade guard, upper and lower • Wheel / pulley guards 	<ul style="list-style-type: none"> • Work piece vise / clamp
Milling Machine	Standing	Electric	<ul style="list-style-type: none"> • Sharp cutting bit – minor lacerations, punctures • Rotating chuck and bit –entanglement • Flying objects – from parts working or centrifugal throw (chuck key, part) – eye, face, skin injuries • Higher torque exerted on work piece – impact injuries 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Anti-restart 	<ul style="list-style-type: none"> • Affixed multi-plane chuck/chip • Drive belt covers • Rear / side shielding as needed 	<ul style="list-style-type: none"> • Spring-loaded chuck wrenches (if used) • Vise – secured • Retractable handles on powered tables
Planer	Bench or Standing	Electric	<ul style="list-style-type: none"> • Sharp cutting heads – serious lacerations, amputations • Rotating (horiz.) parts –entanglement • Flying objects – eye, face, skin injuries 	<ul style="list-style-type: none"> • E-stop • Anti-restart for wood 	<ul style="list-style-type: none"> • Adjustable entry / feed • Cutting head 	<ul style="list-style-type: none"> • Push sticks • Outfeed support • Hearing protection for high noise planing
Press	Bench or Standing	Manual	<ul style="list-style-type: none"> • Caught between – crushing • Flying objects – eye, face, skin injuries 		<ul style="list-style-type: none"> • Portable shield or cage for potential shattering object 	<ul style="list-style-type: none"> • Warning label

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Printer, 3-D	Bench or Standing	Electric	<ul style="list-style-type: none"> • Moving head – physical injuries • Ink aerosol – inhalation exposure 	<ul style="list-style-type: none"> • E-stop • Anti-restart • Key or code access 	<ul style="list-style-type: none"> • Interlocked cover / access 	
Printing Press	Bench or Standing	Electric	<ul style="list-style-type: none"> • Rotating parts, pulleys, wheels - entanglement • Caught between - crushing • Possible flying objects – eye, face, skin injuries • Pinch points – crushing, bruising • Ink and cleaning solvents - chemicals 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Anti-restart 	<ul style="list-style-type: none"> • Pulley(s) • Feeds • Rollers 	<ul style="list-style-type: none"> • Gloves (nitrile exam) for incidental chemical handling and cleaning • Chemical substitution
Punch	Bench or Standing	Manual	<ul style="list-style-type: none"> • Caught between – crushing, bruising • Possible flying objects – eye, face, skin injuries 			
Radial Arm Saw	Bench	Electric	<ul style="list-style-type: none"> • Sharp cutting blade – serious lacerations and amputations • Flying objects – eye, face, skin injuries • Rotating shaft / blade –entanglement 	<ul style="list-style-type: none"> • Finger /constant pressure switch, E-stop, accessible single action hand switch, or foot switch • Anti-restart 	<ul style="list-style-type: none"> • Top enclosed blade cover • Blade (self-adjusting) 	<ul style="list-style-type: none"> • Auto-retraction • Fence (kerfed to avoid restricting blade guard) • Clamps • Faceshield if excessive flying objects expected
Robotics Devices (tabletop, instructional)	Bench or Standing	Electric	<ul style="list-style-type: none"> • Various moving parts – physical injuries • Possible flying objects – eye, face, skin injuries 	<ul style="list-style-type: none"> • E-stop • Anti-restart • Key or code access 	<ul style="list-style-type: none"> • Enclosure as feasible • Interlocked cover / access as feasible 	<ul style="list-style-type: none"> • Marked exclusion zone
Roller, Sheetmetal	Bench or Standing	Manual	<ul style="list-style-type: none"> • Caught between / pinch points – crushing, limited by manual operation 			<ul style="list-style-type: none"> • Warning label

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Roller, Sheetmetal	Bench or Standing	Electric	<ul style="list-style-type: none"> • Caught between / pinch points – serious crushing, amputation 	<ul style="list-style-type: none"> • E-stop (manual, foot, bump, wire, light curtain) • Anti-restart 	<ul style="list-style-type: none"> • Sliding adjustable roller shield 	<ul style="list-style-type: none"> • Warning label
Sander, Belt (vertical or horizontal)	Bench or Standing	Electric	<ul style="list-style-type: none"> • Flying objects – eye, face, skin injuries • Rotating pulleys, belts - entanglement • Pinch points – crushing, bruising 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Anti-restart 	<ul style="list-style-type: none"> • Pulleys • Rollers (both sides) • Area below tool rest 	<ul style="list-style-type: none"> • Tool rest
Sander, Disc	Bench or Standing	Electric	<ul style="list-style-type: none"> • Flying objects – eye, face, skin injuries • Rotating pulleys, belts - entanglement • Pinch points – crushing, bruising 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Anti-restart for wood 	<ul style="list-style-type: none"> • Pulleys • Side 	<ul style="list-style-type: none"> • Tool rest
Saw, Cut-Off (abrasive disc and metal cutting)	Bench	Electric	<ul style="list-style-type: none"> • Sharp cutting blade – lacerations, amputations • Rotating blade –entanglement • Flying objects – eye, face, skin injuries • Heat / sparks – burns, fire 	<ul style="list-style-type: none"> • Finger / constant pressure switch 	<ul style="list-style-type: none"> • Blade (self-adjusting) 	<ul style="list-style-type: none"> • Auto-return to upright • Fence • Vise – bolted / clamped • Clamps
Saw, Miter / Compound Miter Chop-Style Saw	Bench	Electric	<ul style="list-style-type: none"> • Sharp cutting blade – lacerations, amputations • Rotating blade –entanglement • Flying objects – eye, face, skin injuries • Heat / sparks – burns, fire 	<ul style="list-style-type: none"> • Finger / constant pressure switch 	<ul style="list-style-type: none"> • Blade (self-adjusting) 	<ul style="list-style-type: none"> • Auto-return to upright • Fence • Clamps • Laser sighted cut
Saw, Upright Panel Style	Standing	Electric	<ul style="list-style-type: none"> • Sharp cutting blade – lacerations, amputations • Rotating blade –entanglement • Flying objects – eye, face, skin injuries • Heat / sparks – burns, fire 	<ul style="list-style-type: none"> • Finger / constant pressure switch 	<ul style="list-style-type: none"> • Blade (self-adjusting) 	<ul style="list-style-type: none"> • Auto-return • Fence • Clamps

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Saw, Wet Abrasive	Bench or Standing	Electric	<ul style="list-style-type: none"> • Sharp cutting blade – lacerations, amputations • Rotating blade –entanglement • Flying objects – eye, face, skin injuries • Heat / sparks – burns, fire • Water / electrical – shock 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch 	<ul style="list-style-type: none"> • Blade 	<ul style="list-style-type: none"> • GFCI outlet / plug adapter • Fence • Clamps • Faceshield as needed
Shaper / Inverted Router (Table)	Bench or Standing	Electric	<ul style="list-style-type: none"> • Sharp cutting tool – lacerations, amputation • Rotating tool –entanglement • Flying objects – eye, face, skin injuries 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Anti-restart for wood 	<ul style="list-style-type: none"> • Cutting tool guard 	<ul style="list-style-type: none"> • Fence • Pushsticks
Shear / Cutter	Bench or Standing	Manual	<ul style="list-style-type: none"> • Sharp cutting blade – serious lacerations, amputations • Caught between - crushing 		<ul style="list-style-type: none"> • Blade 	<ul style="list-style-type: none"> • Warning label
Shear / Cutter	Bench or Standing	Electric	<ul style="list-style-type: none"> • Sharp cutting blade – serious lacerations, amputations • Caught between – crushing 	<ul style="list-style-type: none"> • E-stop or foot switch • Anti-restart 	<ul style="list-style-type: none"> • Blade and hold down guard • Rear access prevention 	<ul style="list-style-type: none"> • 2-hand controls as interim
Surface Grinder	Bench or Standing	Electric	<ul style="list-style-type: none"> • Rotating shaft and wheel – pinch points, abrasions, entanglement • Flying objects – parts or wheel shatter - eye, face, skin injuries • Heat / sparks - burns, fire 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Anti-restart 	<ul style="list-style-type: none"> • Wheel guard • Shielded table 	<ul style="list-style-type: none"> • Faceshield if excessive flying objects expected
Table Saw	Standing	Electric	<ul style="list-style-type: none"> • Sharp cutting blade – serious lacerations or amputation • Rotating blade –entanglement • Flying objects – eye, face, skin injuries 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch • Anti-restart for wood 	<ul style="list-style-type: none"> • Blade (self-adjusting) 	<ul style="list-style-type: none"> • Fence and miter • Splitter / riving knife • Anti-kickback pawls • Pushsticks • Featherboards / jigs • SawStop required for student shops

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Water Jet Cutter	Bench or Standing	Electric	<ul style="list-style-type: none"> • High pressure water – lacerations • Moving spray head(s) – physical injuries 	<ul style="list-style-type: none"> • E-stop • Anti-restart • Key or code access 	<ul style="list-style-type: none"> • Interlocked cover / access 	<ul style="list-style-type: none"> • GFCI outlet / plug adapter
Wire Wheel	Bench or Standing	Electric	<ul style="list-style-type: none"> • Rotating shafts and wheels – abrasions, lacerations, entanglement • Flying objects – eye, face, skin injuries • Pinch points – crushing, bruising • Heat / sparks - burns, fire 	<ul style="list-style-type: none"> • E-stop, accessible single action hand switch, or foot switch 	<ul style="list-style-type: none"> • Wheel enclosure as feasible 	<ul style="list-style-type: none"> • Tool rest if needed • Clamps for holding small parts • Faceshield if excessive flying objects expected

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