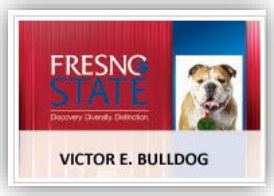
FRESNO STATE
Lyles College of Engineering

Red Tag Basics

The following manual assumes some basic knowledge of tools. There are technical terms, some of which may not be fully explained. If you don't have any previous experience, don't be afraid – Every term will be fully explained during your Red Tag tour. However, reading this manual before the tour is still a good idea, so you have heard the words. The photos in this document represent tools and may not be exactly what we have in machine shops.

Red Tag Users:

- Must always wear their Red Tag visibly.
- Are required to wear safety glasses all the time while in the building.
- Must use additional Personal Protective Equipment (PPE) when required.
- May observe welding only while wearing eye protection of the proper shade and clothing that covers exposed skin.
- Must check in with a valid Fresno State Student ID.
- Must be currently enrolled at Fresno State in Engineering.
- Are expected to ask questions if in doubt about safety or operations or unfamiliar with a tool.
- When introducing a new chemical, you must supply an MSDS (Material Safety Data Sheet) to the technician. Also, you must leave a copy of the MSDS in the shop when you leave and have the students read the MSDS.



Red Tag Tool Safety

General:

- Red Tag users must always wear safety glasses while they are in the shop.
- You must abide by all shop procedures and safety rules.
- If you don't know how to use a tool, or don't remember, ask a Tech. Shop Techs will always be identified.
- Wear appropriate clothing and PPE for the job.
- Clean grease and oil from hands before using tools to prevent slipping.
- To prevent injury or damage to your project, use only tools that are in good condition.
- If you break a tool, stop using it and return it to a Tech, (We won't penalize
- you for accidental breakage, but we will if you hide the problem and compromise others' safety).
- If you notice unsafe behavior, ask them to stop and report them to a Tech.
- Report any spills to a Tech. Remove possible snag hazards (E.g., roll sleeves, tie hoodie strings, rings off, etc. Bracelets and rings may be taped). Long hair must be tied up.
- Immediately report all injuries, no matter how minor, to a Tech.
- Dispose of shop rags by throwing them into the designated trash bin when done with

Safety equipment available for all users:

- Safety glasses for guests; you are encouraged to bring your own.
- Face shields
- Welding glasses/goggles/face masks
- Gloves
- Ear plugs/earmuffs
- Dust and particle masks

Hand Tools

Knives:

- Cut away from yourself and others.
- Don't use dull blades.
- Retract or close the blade when done.
- Don't hit or strike blades with anything.

Files:

- Must always have a handle on the tang (pointy end).
- Don't ever use a prybar or hammer. They are brittle and will break.
- Clean soft metals from them with a "file card" (a special metal brush) immediately after use or when they get clogged.
- Use chalk to prevent clogging by soft metals such as brass or aluminum.

Hammers:

- Don't ever strike two hammer heads together. They can shatter.
- Use an appropriate type and size hammer for the job.
- Make sure the hammer head is securely attached to the handle before use.
- Use mallets for positioning or loosening stuck parts.
- Use claw hammers for driving nails into wood.
- Use ball peen hammers for shaping sheet metal and driving punches and chisels.

Wrenches:

- Must fit the part snugly to prevent slipping and injuring you.
- Pull towards yourself, don't push, for safe control.
- Don't use extensions or "cheaters." You will break or bend the tool.
- Don't ever hammer on the handle.
- The movable jaw of an adjustable crescent wrench must face the direction of rotation.
- Never use pliers or pipe wrenches on parts with flat sides.

Screwdrivers:

- Use the correct type that fits the fastener:
- Flat head/standard (straight blade)
- Phillips (x-shaped)
- Torx (star shaped-6 points)
- Allen (fits into a hexagon-shaped hole)
- Nut driver (fits over hexagon-shaped nut)
- Use the correct driver size that fits the fastener type.
- Don't ever use a screwdriver as a chisel or pry bar.

Pliers:

- Use them to grip surfaces and objects with irregular shapes.
- Don't use them on parts with "flats" (i.e., nuts, bolts, plumbing valves, precision parts), as they will damage the surface.
- Don't grip with your fingers between the handles, as they will be pinched if the tool slips.
- Keep the jaws parallel or the handles close together for the safest grip.
- If the part is too big, use a pipe or strap wrench.

Tin Snips:

- Scissors for sheet metal.
- Wear gloves to protect your hands.
- Watch out for sharp edges.
- Don't force cuts on thick metal. Use other tools, i.e., bandsaw, shear, etc.
- Don't ever cut wire or round stock. It will ruin the blades.
- Don't cut hardened material or welded material.

Chisels and Punches:

- Aim flying chips away from other students.
- Don't use chisels with a "mushroomed" head, have a Tech grind it off.
- Use the appropriate chisel for wood or metal.
- Drive a wood chisel with a mallet.
- Drive a metal chisel or punch with a ball peen hammer.

Taps:

- Used to thread a hole so a screw can screw into it.
- Use the proper size tap in the proper size hole (see a tapping chart before you drill. A ¼" hole will be too big to thread for a ¼" bolt).
- Turn the tap with a tap handle that fits it.
- Use tapping fluid to prevent binding the tap.
- Rotate 1/2 turn, then reverse a ¼ turn to break chips.
- Taps are brittle, so enter the hole straight. Don't try to bend them. Tap guides are available.
- Don't force it! If it sticks or is hard to turn, ask for help. If you break a tap, it is nearly impossible to remove it. You will need to redo your entire part.
- Small taps are very easy to break. Turn them very gently. Going in crooked is the easiest way to snap them.

Dies:

- Used to thread a shaft so that a nut will screw onto it.
- Start squarely on the chamfered end of a proper size rod (nominal size of the thread or preferably slightly undersized).
- Start with the leading side of the die (it has a chamfer on the first 2 or 3 threads and is wider).
- Do not try to extend the threads on a hardened bolt. It will break the die.
- Use the appropriate die holder.

Reamers:

- Used to make a very precise diameter hole.
- Never rotate them backward. Their cutting surface may chip.
- Turn them with a T-handle or tap handle.
- Lightly chamfer the hole edge with a countersink and use cutting oil or tapping fluid.
- Power-ream at very slow speeds.

Hand Saws:

- Hacksaws are for metal; wood saws are for wood.
- At least three teeth must span the thickness of the material to be cut.
- Keep hands out of the plane of the blade.
- Keep hands on top of the material being cut.
- Start and end your cut gently to prevent damage to the saw blade and prevent chip-out.

Vise and Clamps:

- Used to hold parts very securely.
- Don't over-tighten the handle. You may damage the part or the vise.
- Make sure the setup is stable and secure before working.
- Use "soft jaws" to hold soft materials without damage.
- Hold round stock securely with a "Vee block" in a vise.
- Don't ever use "cheater bars" or hammers on the handle.

Measuring Tools:

- Retract tape measures slowly to avoid breaking the tape.
- Scribe lines with scratch awls or dividers.
- Keep measuring tools clean.
- Don't mark up or abuse rulers or use them as prybars.
- Handle calipers and micrometers with care.
- Clean measuring faces between uses with your clean fingers or a sheet of paper.
- Don't ever use calipers to scribe lines, as this will ruin the ends of the jaws.
- Clamp measuring tools gently for accuracy and to prevent tool damage.

Air Powered Hand Tools

General:

- Inspect air hoses for leaks, stripped fittings, and other damage. Tell a Tech if damaged!
- Disconnect the air supply to change bits, blades, etc.
- Make sure that the RPM speed of the tool does not exceed the rating of the bit, wheel, blade, etc., that you use. Otherwise, it may fly apart. Some air tools have very high RPM speeds (>20,000 RPM).
- Make sure that the tool is rated for a pressure that is lower than the air it is powered by.
- Don't put the tool down until the motor completely stops.
- Watch what's on the other side of what you're drilling or cutting, and don't put your hand there.
- Use a face shield and safety glasses when working with materials or tools that may throw debris or sparks.
- Use the proper dust mask or respirator on dust-producing materials.

- Don't point a blow-off gun at yourself.
- It can drive particles under your skin or tear the skin from your flesh.
- You are responsible for ensuring that your use of air tools does not injure others. (i.e., do not blow chips toward someone)
- Don't ever point a blow-off gun at anyone or spray air at them – no horseplay!

Sand Blaster:

- You must wear earmuffs when operating the sandblaster.
- Other mandatory protection includes a face shield and dust mask.
- All workpieces must be clean (free of grease, oil, etc.) and dry.
- Shut off and relieve air pressure before opening the cabinet.
- Discontinue use and inform the Tech if the sandblasting machines' gloves develop cracks, tears, or holes.

Electric Hand Tools

General:

- Before using, inspect the cord for missing prongs, frays, cuts, and other damage.
- Don't use a tool if the cord or the tool is damaged or the tool makes funny sounds.
- Always unplug the tool to change bits, blades, etc.
- Remove chuck keys and tighten tools immediately. (i.e., as soon as you are done with them.)
- Make sure that the RPM (speed) of the tool does not exceed the rating of the bit, wheel, blade, etc., that you use. Otherwise, it may fly apart.
- Wire brushes often throw wire. Wear safety glasses and a face shield and protect others around you.
- Don't put the tool down until the motor completely stops.
- Watch what's on the other side of what you're drilling or cutting, and don't put your hand there.
- Use a face shield and safety glasses when working with materials or tools that may throw debris, especially high-speed tools like routers.

- Use the proper dust mask or respirator when working on dust or fume-producing materials.
- Don't exceed the capacity or force the tool.
- Be aware of fire or burn danger when using soldering tools or heat guns. Always place hot tools and objects on a non-flammable surface.

Jigsaw (Saber Saw):

- Select the proper blade for the material to be cut and secure the blade in the saw before plugging in the electric cord.
- Use a relief cut on corners to prevent binding or pinching the
- blade. This will prevent the blade from breaking.
- Hold the jigsaw down firmly against the workpiece to prevent vibration or injury.

Electric Drill:

- Center the punch hole to be drilled.
- Tighten the drill bit in the chuck using the chuck key and remove the chuck key immediately after use.
- Securely clamp the workpiece before drilling. A workpiece that moves when being drilled can break the drill, injure the operator, and destroy itself.
- Hold the drill firmly and keep hands away from the revolving bit.

- Use a larger drill if a larger hole is needed. Using side pressure on the drill to "wobble" out the hole to increase the diameter will damage the drill and cause it to break.
- Apply straight and steady pressure on the drill and ease up on the pressure as the drill breaks through the material.
- With the motor still running, back out the drill as soon as the hole is drilled.
- Turn off the drill and hold it firmly until it comes to a complete stop before laying it on the workbench.

Handheld Angle Grinder:

- You must wear a face shield, tight-fitting leather gloves, and safety glasses when using a disc grinder.
- Grinders are for STEEL ONLY (unless you request otherwise).
- Carefully inspect the entire wheel(s) before using. Don't use them if cracked, chipped, or clogged with metal, they could explode. Report damage to a Tech who will change it for you.
- Always be aware of the direction you are throwing the stream of sparks.
    - It is your responsibility to be sure you are not throwing sparks on other people, in the vicinity of those without eye protection, or on potentially flammable items.
- The disc grinder must be stopped (not spinning) before it can be set down.

Portable Belt Sander:

- Place the sander on its side before plugging the power plug into the outlet.
- Securely clamp the workpiece before sanding.
- Start the sander before touching it to the surface to be sanded.
- Disconnect the power plug before changing the sanding belt.
- The weight of the sander will apply adequate pressure to the sanding surface in most cases.
- Do not apply so much pressure that the sander starts to slow down.

Hand Router:

- Wear a face shield and safety glasses when operating the router.
- Make certain the router bit is fully inserted, and the collet is tightened before using the router.
- Clamp the workpiece securely to a table or bench before routing.
- The router cutter must be completely stopped before laying the router down.
- Do not stand the router on the cutter end when not in use.
- Hold the router firmly with both hands before turning on the power.
- Feed the router at a moderate rate:
    - too slow of a feed rate will cause burning of the wood.
    - too rapid a rate will produce a rough splintery surface.

Power Hand Saw (Skil Saw):

- **Never** disable the blade safety guard or use the saw if there are any problems with the safety guard.
- Select the proper blade for the cut to be made.
- Check that the blade is free of cracks or nicks and that it is sharp.
- Limit the blade extension to 1/4 inch below the piece being sawed.
- Support the wood being cut so that it doesn't "pinch" the blade and stop the saw or doesn't break off near the end of the cut.
- Hold the saw firmly with both hands before turning on the power.
- Feed the saw at a moderate rate. Too slow of a feed rate will cause burning of the wood. Too rapid a rate will produce a rough splintery surface.
- Stand to the side of the saw in case it "kicks back."
- Be aware of what's under the material you're cutting! (i.e., fingers, table edge, metal sawhorses, etc.)

Stationary Power Tools

Drill Press:

- Use a center punch to help locate the hole to be drilled in the correct place.
- Select the correct speed for the material and size drill being used.
- **Remove the chuck key immediately after tightening or removing a Drill bit!** (Leaving it in the chuck increases the risk of injury or damage.)
- All work must be held securely for drilling using either a drill vise or C-clamps.
  - A workpiece that moves when being drilled can break the drill, injure the operator and destroy itself.
- Don't drill into the vise or table. Place wood under the part for "through" holes.
- Hold round stock securely with a "Vee block" in a vise.
- Large workpieces must be set firmly against the left side of the drill press column so that if the drill grabs, it cannot spin the workpiece and cause injury to the operator or others.

- If the drill grabs the workpiece, yanks loose of the clamps, and begins to spin, maintain downward pressure with the press, and turn off the power.
  - Do not retract the drill, as this would allow the workpiece to be thrown from the press and may cause serious injury.
- If the drill bit binds or sticks in your workpiece (drill bit stops spinning while chuck is still spinning or park breaks loose and starts spinning), you should maintain downward pressure and turn off the machine.
- Hands must be clear of the revolving spindle, chuck, drill, and chips.
- Always ease up on the feed or drill pressure as the drill begins to break through the workpiece. Heavy feed pressure will cause the drill to dig in and could damage the drilled material, break the drill, or cause the workpiece to spin.
- When drilling large holes, drill a pilot hole with a small drill, such as 1/8 inch, and then step up in size to prevent drill chatter.
- Be sure the drill press is stopped before removing the workpiece or clearing chips or cuttings.

Vertical Bandsaw:

- When feeding a workpiece into the bandsaw blade, your hands should not be in line with the blade in case you slip.
- Adjust the blade guides and rollers properly, and adjust the
- speed. The upper saw guide should be about 1/4 inch above the workpiece.
- Check the workpiece to be sure it is free of debris (i.e., rocks, tool bits, nails).
- Plan the cut to prevent backing out of a cut, as this will pull the blade off the wheels. Make relief cuts as needed for tight radius areas.
- Holding the workpiece firmly, start the cut gently, then feed at a moderate rate.
- Use a push stick when sawing small or difficult-to-hold pieces.
- A minimum of three teeth must be engaged in the workpiece at all times, or the teeth will be torn off the blade.
- Note: Bandsaws can cut metals, wood, or plastics.

Horizontal Bandsaw:

- Clamp the workpiece snugly in the vise, but don't over-tighten!
- The vise jaws must be parallel. Use a spacer block to keep the jaws parallel when cutting short or odd-shaped pieces.
- Support the descent of the saw with your hand as it starts the cut, or for the entire cut when cutting thin stock or if the saw drops rapidly.
- Adjust the blade guides and rollers properly and adjust the speed. The leading saw guide should clear the jaws when it descends but be as close to the jaws as possible.
- Check the workpiece to be sure it is free of defects (i.e., broken-off tool bits, nails, etc.).
- A general rule for selecting a bandsaw blade for your project is, Coarse teeth are for softer materials, and Fine teeth are for harder materials.
- A minimum of three teeth must be engaged in the workpiece at all times, or the teeth will be torn off the blade.
- Hold round stock securely with a "Vee block" in the vise.
- The Horizontal Bandsaw is a flood coolant machine. The fluid that flows over the blade is recirculated. If the fluid is not flowing, don't use it. Inform a Tech immediately, and it will be refilled.
- Note: Bandsaws are available to cut metals, wood, or plastics.

Bench Grinder:

- The tool rest must be within 1/8 inch of the wheel face. Have a Tech adjust it if it is farther away.
- Stand to the side of the grinder, not in line with the wheels, when turning on the grinder and while the wheels are accelerating, as this is the most common time for a damaged wheel to fly apart.
- Do not allow hands to come in contact with the grinding wheel while it is in motion.
- To safely grip small parts smaller than two inches, **only** use Vise-Grip (locking) pliers.
- Carefully inspect the entire wheel(s) before using. Don't use them if cracked, chipped, or clogged with metal, they could explode. Report damage to a Tech who will change it for you.
- Don't use a grinding wheel when it is worn, uneven or out, or out of round. Have a Tech "dress" it square and round.
- Hold the work firmly, and grind without bumping or impacting the grinder wheel.
- Use only enough pressure to ensure grinding, but not heavy pressure, as this will cause overheating and grinder damage.
- When the workpiece begins to get warm, cool it in water.
- Grind only on the face of the wheel. Grinding on the side can cause the grinder wheel to explode due to heat stress buildup.
- Keep the workpiece in motion across the face of the wheel.
- Grinding wheels are for **steel only**; they are not for grinding aluminum, brass, or copper: the soft metal becomes embedded in the wheel, overheats, and can explode.

Cutoff (Chop) Saw:

- You must wear a face shield, ear protection, and safety glasses when using the cutoff saw.
- Carefully inspect the entire blade before using. Don't use it if cracked, chipped, clogged with soft metals, etc., it could explode. Report the damage to a Tech.
- The workpiece must be securely clamped. **No Exceptions!**
- The cutoff saw, like the grinder, is for **steel only**.
  - Aluminum, brass, copper, and other soft metals will build up on the blade and cause it to overheat and explode. Blades are available for soft metals. Ask a Tech.
- The vise jaws must be parallel. Use a spacer block to keep the jaws parallel when cutting short or odd-shaped pieces.
- Spacer blocks should be the same thickness as the material being clamped.
- Hold round stock securely with a "Vee block" in the vise.

Wire Wheel/Cloth Buffer:

- Hold the workpiece firmly with both hands.
- Keep hands away from the wire wheel or buffer while it is in motion.
- Gloves are not allowed.
- Work only on the downward-spinning half of the wheel.
- When using the wire wheel, hold the part on the bottom of the wheel.
- If buffing, apply buffing compound sparingly to cloth buffers.
- Using excessive pressure will cause the workpiece to overheat and damage the surface.

Solvent Tank:

- Use of the elbow-length rubber gloves provided is required.
- Pre-clean the parts to remove excess grease, oil, and other foreign substances so that the solvent does not become too contaminated to use.
  - (Note: the solvent is recirculated continuously)
- When not in use, the lid is to remain closed and not used as a table.
- No additional solvents may be added to the solvent tank.
- Ask a Tech to replace the solvent if it pumps slowly or not at all.

Woodshop Machines

General:

- Before using any wood tools, you must inspect your material for foreign metal objects, such as nails, screws, staples, etc.
- **All safety guards must be in place and operational!**

Table Saw:

- Select the proper blade for the cut to be made. Check that the blade is free of cracks or nicks and that it is sharp. Ask a Tech to change the blade for you. Only a Tech may change the blade.
- Use the ripping fence or the angle guide when cutting material, but don't use both simultaneously!
- Keep a push stick available and use it to keep fingers away from the blade.
- Start cuts slowly and then feed the workpiece at a moderate rate.
- When using the fence to rip cut a workpiece, the operator and all observers must not stand in line with the workpiece.
- It can get pinched between the spinning blade and the fence.
- causing it to kick back (be fired straight back out of the saw rapidly).
- When cutting large or long pieces on the table saw, use an assistant to support the edge or end of large or long pieces being sawed.
- Make sure the table saw has a blade guard, splitter, and anti-kickback device installed and operational before using the saw. Exceptions may be made for specialty cuts (e.g., dados). Only a Tech may disengage or remove these guards.
- You may not cut any workpiece on the table saw that is less than 12 inches in length.
- The table saw is only for cutting dry wood or non-conductive plastic materials!

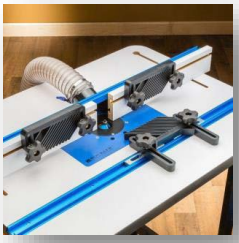
Planer/Jointer:

- All guards must remain in place and properly operate before using the planer/jointer.
- Use the special push blocks or push sticks when feeding wood through the jointer (on the top of the machine).
- Never put your hand on top of the workpiece. If a kickback should occur with the hand over the spinning blade, your hand will fall into the blade, and serious injury will result.
- Don't exceed the capacity of the machine.
- Stand to the side of the jointer when in operation.
- Limit the depth of the jointer cut to 1/16 inch maximum. The jointer is intended for light finish cuts only. Thin cuts produce the best surface finish.
- Do not feed material less than 12 inches long through the jointer.
- The workpiece must be pushed far enough past the cutter knife blades to allow the safety guard to close before picking it up.

- Feed the workpiece at a constant moderate rate and into the rotation of the cutter (from right to left).
- Take thin cuts in the planer slot (1/16 inch maximum), raising the table in small increments.
- The planer slot self-feeds. Simply place the wood in position, let the machine grasp it, and it will feed automatically; don't push it!
- If the machine slows down or labors, take a thinner cut!

Router Table:

- Use the safety guard, make sure the set-up is stable, the bit is fully inserted, and the collet tightened before using the router.
- Wear ear protection and safety glasses when using the router table.
- All guards must remain in place and properly operate before using the router table. If you need them off for a process, a Tech must remove them!
- Stand in front of the machine when in operation. If the bit grabs the part, it could throw the wood to the side.



- Keep hands far away from the spinning bit. Use push stick(s).
- Do not feed material less than 12 inches long through the router.
- Never put your hand on top of the workpiece. If a kickback should occur with the hand over the spinning blade, your hand will fall into the blade, and serious injury will result.
- Feed the workpiece at a constant moderate rate and into the rotation of the router (from right to left).
- Don't exceed the capacity of the tool. If it slows down or burns the wood, take a lighter cut.

Compound Miter Saw:

- Secure the workpiece with the supplied hold-down levers. Holding the workpiece with your free hand is also acceptable if it is clear of the blade.
- Make all cuts pushing away from you, not straight down.
- Lower the saw into position, then start the saw and push it through the workpiece.
- Start cuts slowly and then feed the workpiece at a moderate rate.
- When cutting long pieces on the compound miter saw, extend the ends of the saw stand to support the work.
- Make sure the compound miter saw has an operational blade guard. You may not cut any workpiece on the compound miter saw that is less than 12 inches in length.
- The compound miter saw is for cutting wood or plastic materials only.

Disc/Belt Sanders:

- Check the sanding belt or disk to ensure it is in good condition and not torn. A Tech will replace worn belts or disks for you.
- Keep fingers and hands clear of the moving or rotating surface.
- Hold the workpiece securely and use only moderate pressure.
- Sand only on the downward-spinning side of the disk sander.
- Move the workpiece side to side on the sanding surface to prevent rapid wear of the belt or disc.

Scroll Saw:

- Ask a Tech to teach you how to set blade tension and select the blade.
- Unplug the machine before handling or changing the blade.
- Cut only stock that is flat on at least one side.
- The scroll saw foot should apply pressure to the workpiece. The foot holds the workpiece down on the table.
- Keep your fingers away from the blade, use a push stick for safety.

Sheet Metal Tools

General:

- Do not exceed the capacity of the sheet metal tools (.060” for steel, .100” for aluminum)!
- Use the “Go-No Go” Blocks to test the metal thickness before using the tool.
- NEVER cut round materials (wire, bolts, rod, etc.) in sheet metal tools. The cutting surfaces will chip or break.
- Avoid pinching your or someone else’s hands in the mechanism.
- Always operate the sheet metal tools while standing in front of them.
- Gloves are safe to wear to avoid cutting yourself on sharp sheet metal edges.
- Don’t force the tool. If it doesn’t cut easily, ask a Tech for help!
- Plan your sequence of cuts and/or bends by bending a piece of paper or cardboard in the tools as a prototype. This way, you can avoid tool/part interference problems.
- Dispose of sharp scrap carefully.

Sheet Metal Shear:

- Keep fingers and measuring scales out of the way of the blade.
- Place the sheet against the guide and then clamp it in position with the clamp on the machine.
- Don’t jump up and down on the treadle (large yellow lever). Operate by standing on it and using the other foot to stomp the treadle down.
- Return the treadle to the up position slowly with foot pressure. Do not let it make a rapid return.
- Pick up the scrap pieces when you have completed cutting.

Sheet Metal Brake:

- Adjust the clamping bar correctly to suit the gauge of metal being formed and stand clear of the moving part of the brake. Ask a Tech for help.
- Keep fingers clear of the jaws of the brake.

Rotex Punch:

- Align the same size punch (top) with the die (bottom).
- Run the machine through a cycle without any metal to check alignment.
- Center punch your work and align it with the “point” on the top die.
- Don’t ever force the machine, if it won’t cut easily, ask a Tech!

Hydraulic Equipment

General:

- You must ask the Tech for permission to use any hydraulic equipment.
- Hydraulic equipment can produce tremendous forces. Be cautious, methodical, and observant when you use it!
- **Never** use any hydraulic equipment that leaks.
- **Never** force any hydraulic equipment!

Floor Jack:

- Use the floor jack only to lift. Once the object has been lifted, place a stable, permanent support under the item (i.e., jack stands, engine stand, etc.).
- [See below for Jack Stand/Engine Stand instructions.]
- **Never** use concrete blocks as a support, and never place the jack on dirt!
- **Never** put any part of yourself or others under anything lifted by a floor jack.

Engine Hoist:

- Use the engine hoist only to lift. Once the object has been lifted, place a stable, permanent support under the item (i.e., jack stands, engine stand, etc.).
- [See below for Jack Stand/Engine Stand instructions.]
- Never place any part of yourself or others under an object lifted by an engine hoist.
- Never use concrete blocks as support; never place them on dirt!

Jack Stands and Engine Stands:

- Place on a firm, even surface, not on dirt.
- Use at least two (2) Jack Stands and make sure the load is stable.
- Lower the load carefully onto the jacks while ensuring it is safe and stable.

Hydraulic Tubing Bender:

- Wear safety glasses and keep your face away from the hydraulic lines. If they leak or burst, the high-pressure fluid can cause serious injury!
- Never place any part of yourself or others in a position where they could be pinched or trapped by a tube being bent.
- Use the correct die set to bend the material. Make sure all parts are secure and properly installed. Make sure the proper length of pivot pins is installed.
- Always do at least one test piece before bending your project.
- Do not exceed the capacity of the bender. If it's not working, ask a Tech!

Hydraulic Press:

- You must wear safety glasses and a face shield when using or observing the use of the hydraulic press.
- Make certain the work is solidly supported on the table and is aligned with the ram. Unstable set-ups can fly apart with extreme speed!
- Don't stack spacers, blocks, etc. unless absolutely necessary.
- Apply force on the part slowly while observing the set-up.
- Chamfer ends of shafts and holes, so parts self-align as they're pressed.
- Do not exceed the capacity of the hydraulic dress.

Hand Arbor Press:

- You must wear safety glasses and a face shield when using or observing use of the arbor press.
- Make sure the set-up is stable and aligned with the force to be applied.
- Don't stack spacers, blocks, etc. unless absolutely necessary.
- Chamfer ends of shafts and holes, so parts self-align as they're pressed.
- Use even pressure, start carefully. If it doesn't go easily, ask a Tech!