The rules and policies explained in this manual pertain to ALL users of the ABE shop; including faculty, staff, and students. Any violations of these policies will result in revoked access to the ABE shop, which is under the control of shop management.

1. **General Shop Safety**

   - The hazards associated with shop work require special safety considerations. Whether you work in the metal shop or wood shop, the potential hazards for personal injury are numerous. This manual highlights essential safety information for working in the SDSU ABE (Ag & Biosystems Engineering) shop. The following table highlights a few common shop hazards:

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</table>
• It is not possible to detail all the risks involved with shop work. However, it is possible to foresee many hazards by carefully planning each job. To prevent accidents, utilize your knowledge, training, and common sense. Evaluate potential sources of injury, and attempt to eliminate any hazards.

2. **Personal Protection**

• There are several measures you must take to protect yourself from shop hazards. For example, do not wear the following when working around machinery:
  - Loose fitting clothing
  - Neckties
  - Jewelry
  - Long loose hair

• If you must wear a long sleeved shirt, be sure the sleeves are rolled down and buttoned. Snug fitting clothes and closed toe shoes are essential safety equipment in the shop.

• Always wear safety glasses when working with shop equipment. Additional protection using goggles or face shields may be necessary for work such as grinding and welding.

• Wear suitable gloves when working with products such as:
  - Scrap metal or wood
  - Sharp-edged stock
  - Unfinished lumber

• Ear protection should be used when operating loud equipment (available in room 127B).

3. **Job Safety**

• Before beginning work in the shop, be sure you are authorized to perform the work to be done and inspect your tools and equipment. If a procedure is potentially hazardous to others in the area, warn fellow workers accordingly. Use warning signs or barriers, as necessary.

• Notify your supervisor if you notice any unsafe conditions such as the following:
  - Defective tools or equipment
  - Improperly guarded machines
  - Oil, gas, or other leaks
  - Any other condition that you feel may jeopardize you or your co-worker’s safety

• Inform other employees if you see an unsafe work practice; however, be careful not to distract a person who is working with power tools.
4. **General Safety Guidelines**

- Follow these guidelines for general shop safety:
  - Know the hazards associated with your work. Be sure you are fully educated on the proper use and operation of any tool before beginning a job.
  - Always wear appropriate safety gear and protective clothing.
  - Ensure that there is adequate ventilation to prevent exposure from vapors of glues, lacquers, paints and from dust and fumes.
  - Maintain good housekeeping standards.
  - Keep the work area free from slipping/tripping hazards (oil, cords, debris, etc.).
  - Clean all spills immediately.
  - Remove sawdust, wood chips, and metal chips regularly.
  - All containers must be labeled.
  - Leave in place and utilize all shielding on tools and equipment.
  - Know where fire extinguishers are located and how to use them.
  - Make sure all tools and equipment are properly grounded and that cords are in good condition.
  - Tools with grounded plugs are essential for safety.
  - Use extension cords that are large enough for the load and distance.
  - Secure all compressed gas cylinders. Never use compressed gas to clean clothing or skin.
  - Take precautions against heat stroke and heat exhaustion.
  - Wear infrared safety goggles when appropriate, (e.g. when operating brazing or cutting torch).

5. **Respiratory Hazards**

- Asbestos, fiberglass, man-made mineral fibers, PVC, and urethane foam can be extreme respiratory hazards. To protect yourself from these and other respiratory hazards, minimize your exposure to particulate matter from insulation, fumes, dusts, and aerosols.

6. **Using Ladders**

- Follow these guidelines for safe ladder usage:
  - Always inspect a ladder before you climb it. Make sure the steps are sturdy and the locking mechanisms are in good working order.
  - To open a stepladder, make sure the spreader is locked and the pail shelf is in position.
  - To open an extension ladder, brace the bottom end and push the rungs or rails out.
  - Place ladders on a solid, level surface to ensure safety.
  - Position a straight or extension ladder so that the use of the ladder is one foot away from the vertical support for every four feet of working ladder height (e.g., if you are working with eight feet of ladder, place the base of the ladder two feet from the wall).
  - Do not place the top of a ladder against a window or an uneven surface.
  - Do not place a ladder in front of a door unless you lock and barricade the door and post a warning sign on the opposite side of the door.
Never allow more than one person on a ladder.

To climb or descend a ladder, face the ladder and firmly grip the rails, not the rungs, with both hands.

Keep your body between the rails at all times. Do not shift your weight to one side.

Have somebody steady the ladder if it cannot be secured otherwise.

Do not stand on the bucket shelf of a ladder.

When working on a ladder, carry small tools on a tool belt. Use a rope to raise and lower heavy tools.

7. Painting

- When working with paint or painting equipment, it is important to have adequate ventilation and to avoid flames or other sources of ignition. Because most paints, varnishes, and thinners are flammable, painting should be conducted in a well-ventilated area. Always wear personal protective equipment when working with paint.

8. Hand Tool Safety

- Hand tools are non-powered tools. They include axes, wrenches, hammers, chisels, screwdrivers, and other hand-operated mechanisms. Even though hand tool injuries tend to be less severe than power tool injuries, hand tool injuries are more common. Because people take everyday hand tools for granted, they forget to follow simple precautions for safety. The most common hand tool accidents are caused by the following:
  - Failure to use the right tool
  - Failure to use a tool correctly
  - Failure to keep edged tools sharp
  - Failure to replace or repair a defective tool
  - Failure to store tools safely

  **IMPORTANT:** *Use the right tool to complete a job safely, quickly, and efficiently.*

- Follow these guidelines for general hand tool safety:
  - Always wear safety glasses
  - Do not use a screwdriver as a chisel.
  - Do not use a chisel as a screwdriver.
  - Do not use a knife as a screwdriver.
  - Never carry a screwdriver or chisel in your pocket. If you fall, the tool could cause a serious injury. Instead, use a tool belt holder or tool box.
  - Replace loose, splintered, or cracked handles. Loose hammer, axe, or maul heads can fly off defective handles.
  - Use the proper wrench to tighten or loosen nuts.
  - When using a chisel, always chip or cut away from yourself. Use a soft-headed hammer or mallet to strike a wooden chisel handle. A metal hammer or mallet may cause the handle to split.
Do not use a wrench if the jaws are sprung.
Do not use impact tools, such as chisels, wedges, or drift pins, if their heads are mushroom shaped. The heads may shatter upon impact.
Direct saw blades, knives, and other tools away from aisle areas and other employees.
Keep knives and scissors sharp. Dull tools are more dangerous than sharp tools.
Iron or steel hand tools may cause sparks and be hazardous around flammable substances. Use spark-resistant tools made from brass, plastic, aluminum, or wood when working around flammable hazards.

9. **General Power Tool Safety**

- Power tools can be extremely dangerous if they are used improperly. Each year, thousands of people are injured or killed by power tool accidents. Common accidents associated with power tools include abrasions, cuts, lacerations, amputations, burns, electrocution, and broken bones. These accidents are often caused by:
  - Touching the cutting, drilling, or grinding components
  - Getting caught in moving parts
  - Suffering electrical shock due to improper grounding, equipment defects, or operator misuse
  - Being struck by particles that normally eject during operation
  - Touching hot tools or work pieces
  - Falling in the work area
  - Being struck by falling tools

- When working around power tools, you must wear personal protective equipment and avoid wearing loose clothing or jewelry that could catch in moving machinery. In addition to general shop safety guidelines, follow these guidelines for working with power tools:
  - Use the correct tool for the job. Do not use a tool or attachment for something it was not designed to do.
  - Select the correct bit, blade, cutter, or grinder wheel for the material at hand. This precaution will reduce the chance for an accident and improve the quality of your work.
  - Keep all guards in place. Cover exposed belts, pulleys, gears, and shafts that could cause injury.
  - Always operate tools at the correct speed for the job at hand. Working too slowly can cause an accident just as easily as working too fast.
  - Watch your work when operating power tools. Stop working if something distracts you.
  - Do not rely on strength to perform an operation. The correct tool, blade, and method should not require excessive strength. If undue force is necessary, you may be using the wrong tool or have a dull blade.
  - Before clearing jams or blockages on power tools, disconnect from power source. Do not use your hand to clear jams or blockages, use an appropriate tool.
  - Never reach over equipment while it is running.
  - Never disable or tamper with safety releases or other automatic switches.
When the chance for operator injury is great, use a push stick to move material through a machine.

- Disconnect power tools before performing maintenance or changing components.
- Keep a firm grip on portable power tools. These tools tend to "get away" from operators and can be difficult to control.
- Remove chuck keys or adjusting tools prior to operation.
- Keep bystanders away from moving machinery.
- Do not operate power tools when you are sick, fatigued, or taking strong medication.
- When possible, secure work pieces with a clamp or vise to free the hands and minimize the chance of injury. Use a jig for pieces that are unstable or do not lie flat.
- Inspect wiring and mechanisms before operating.
- All machinery repairs must be completed by a certified repair person.

10. **Guards**

- Moving machine parts must be safeguarded to protect operators from serious injury. Belts, gears, shafts, pulleys, fly wheels, chains, and other moving parts must be guarded if there is a chance they could injure an employee.

**IMPORTANT:** Guards must be in place. If a guard is removed to perform maintenance or repairs, immediately replace the guard after repairs are completed. Do not disable or move machine guards for any reason. If you notice that a guard is missing or damaged, contact your supervisor and have the guard replaced or repaired before beginning work. **NOTE:** Hand-held power tools typically have less guarding in place than stationary power tools. Use extreme caution when working with hand-held power tools and always wear a face shield.

11. **Power Tool Operation Safety Guidelines**

- In addition to the safety suggestions for general power tool usage, there are specific safety requirements for each type of tool. The following sections cover safety guidelines for the power tools listed below:
  - Drill press
  - Drill
  - Bench Grinder
  - Jointer
  - Router
  - Nail/air gun
  - Planer
  - Angle grinder
  - Forging machines
  - Sanders
  - Band Saw
  - Circular Saw
o Radial arm Saw
o Table Saw
o Compound miter saw
o Band saw
o Jig saw
o Metal cutoff saw

NOTE: Manuals for all the tools listed above are available in the tool room (ABE 127B in bottom right-hand desk drawer).

11.1. Drill Press

• Follow these safety guidelines when using drill presses:
  o Securely fasten work materials to prevent spinning. Never use your hands to secure work materials.
  o Use a center punch to score the material before drilling.
  o Run the drill at the correct speed. Forcing or feeding too fast can break drill bits.
  o Never attempt to loosen the chuck unless the power is off.
  o Make sure you remove the key from the chuck before turning on the drill.
  o Frequently back the drill out of deep cuts to clean and cool the bit.
  o Bits can be extremely hot after use.
  o Always use cutting oil when drilling metal.
  o When drilling holes larger than 3/8 inch diameter in metal, start with a small hole (pilot hole) and step up to the desired hole size in small increments.

11.2 Drill

• Follow these safety guidelines when using drills:
  o Drill straight in and pull straight out. Twisting or wobbling bit in a hole will damage the bit and cause bodily harm.
  o Bits can be extremely hot after use.
  o Be sure to drill with motor in forward direction. Reverse direction will burn or can ignite wood.
  o Pull bit out of deep holes to remove debris. Excess chips can cause overheating.

11.3 Bench Grinder

• Follow these safety guidelines when working with bench grinders:
  o Ensure that no combustible or flammable materials are nearby that could be ignited by sparks from the grinder wheel.
  o Ensure that a guard covers at least 270 degrees of the grinding wheel on bench-mounted machines.
  o Place the grinder tool rest 1/8 inch from the wheel and slightly above the center line.
Allow the grinder to reach full speed before stepping into the grinding position. Faulty wheels usually break at the start of an operation.

- Unless otherwise designed, grind on the face of the wheel.
- Use a vise-grip plier or clamp to hold small pieces.
- Slowly move work pieces across the face of wheel in a uniform manner. This will keep the wheel sound.
- Do not grind non-ferrous materials.
- Replace wheels that are badly worn or cracked.
- Never use a wheel that has been dropped or received a heavy blow, even if there is no apparent damage.
- Before using a new wheel, let it run a few seconds at full speed to make sure it is balanced.

### 11.4 Jointer

- Follow these safety guidelines when using jointers:
  - Ensure that jointers are equipped with cylindrical cutting heads.
  - Use a push stick, when material being cut is shorter than the fence.
  - Ensure that knives are balanced and correctly mounted.
  - Adjust cut depth before turning the machine on.
  - The jointer should be set to remove 1/16” or less per pass, and should NEVER exceed 1/8” cutting depth.
  - Keep hands positioned on material and on either side of the cutting head, but never directly over the cutting head.
  - Do not use the jointer for strips that are less than 1 inch wide.
  - To adjust the height of the infeed table, move the table to a depth DEEPER THAN desired depth, and then RAISE table to the desired depth (1/16” or less).
  - NEVER remove the guard.

### 11.5 Router

- Follow these safety guidelines when using routers:
  - Hold with both hands. This tool is easy to lose control of.
  - Turn tool on and allow it to come to full speed before cutting the material.
  - Bits can be extremely hot after use.
  - Keep base on flat surface for smooth cuts.
  - Make progressive cuts to desired depth.
  - Speed should be reduced for larger bits.
  - Do not “Climb-cut.” Cut outside edges counterclockwise and inside edges clockwise.

### 11.6 Nail/Air Gun Safety (Pneumatic Fastening Tools)

- Nail guns and air guns are powered by compressed air. The main danger associated with pneumatic fastening tools is injury from one of the tool's attachments or fasteners.
Follow these safety guidelines for working with pneumatic tools:
  o Ensure that pneumatic tools which shoot nails, rivets, or staples are equipped with a device that keeps fasteners from ejecting unless the muzzle is pressed against a firm surface.
  o Never point a tool at items you do not want to fasten.
  o Keep your finger off the trigger until you are ready to begin work. Most pneumatic tools have a *hair-trigger* that requires little pressure to activate the gun.
  o Treat air hoses with the same care as an electrical cord.
  o Do not drive fasteners into hard, brittle surfaces or areas where the fastener may pass through the material and protrude on the other side.

### 11.7 Angle Grinder

Follow these safety guidelines for working with angle grinders:
  o Hold with both hands. This tool is easy to lose control of.
  o Ensure power switch is off before plugging in tool.
  o Lay tool trigger and grinder side up.
  o Always position wheel guard between you and your work.
  o NEVER remove the guard, and never use if guard has been removed.
  o Ensure that no combustible or flammable materials are nearby that could be ignited by sparks from the grinder wheel.

### 11.8 Sanders

Follow these safety guidelines for working with *Circular and Belt Sanders*:
  o Ensure that sanding belts are not too tight or too loose. Never operate a sanding disk if the paper is too loose.
  o Use the correct grade of abrasive material.
  o Ensure that the distance between a circular sander and the edge of the table is not greater than 1/4 inch.
  o Do not push materials against sanders with excessive force.
  o Sand only on the down stroke side of a disk sander.
  o Do not hold small pieces by hand. Use a jig for pieces that are difficult to hold securely.
  o For belt sanders, ensure the belt is tracking in the center of the sander.

Follow these safety guidelines for working *Finishing Sanders*:
  o The weight of the sander is sufficient. Excess pressure on the tool is bad for the motor and is less effective.
  o Abrasive paper should be secure before use.

### 11.9 Saws
There are numerous types of power saws, such as band saws, circular saws, radial arm saws, and table saws. Regardless of the type of saw you use, never reach over the saw line to position or guide materials.

Follow these safety guidelines for working with **Circular Saws**:
- Do not raise the saw any higher than absolutely necessary.
- Set the blade depth 1/16” deeper than material being cut.
- Ensure all guards are in place and functional.
- Never attempt to clear away scraps with your fingers.
- Do not cut thin tubular materials with a circular saw.
- Take care when working with warped or twisted lumber.

Follow these guidelines when working with the **Table Saw**:

*NOTE: The table saw in the ABE shop is a SawStop saw with flesh detecting technology. This will disable the blade if it comes in contact with human flesh, or any conductive material. For this reason, it is important you DO NOT CUT GREEN TREATED LUMBER OR ANY CONDUCTING MATERIAL IN THE SAW.*

- Use a push block whenever project goes over the cutting surface. Keep hands at least 4” from blade.
- Ensure all guards are in place and functional.
- Set the blade to a cutting depth of 1/16” above the material being cut.
- Stand to side of wood being ripped.
- Only use one fence or miter gauge, never use both in conjunction with one another.
- Be sure adjustment wrenches or any other objects have been removed from table before use.
- Hold wood firmly feeding it into blade at a moderate speed. Push wood with a push stick until it clears cutting blade.
- This is not a free-hand machine. Always use a fence or miter gauge.
- Feed against rotation. Wrong way will accelerate wood and cause damage.
- No dead-cuts. Continue ripping all the way through your board without stopping.
- Only use wood that has flat surfaces.
- Only one piece of wood at a time. Do not start a second until first is clear.
- Before cutting, ensure lumber is free of any foreign material which may harm the blade.

Follow these guidelines when working with **Compound Miter Saws**:
- Blade should be sharp, run freely, and be free of vibration.
- Ensure all guards are in place and functional.
- Let blade come to full speed before beginning cut.
- Do not cross your arms while using the saw.
- Start the saw, pull out, push down, and push back.
- Allow blade to stop completely before lifting up.
- Do not attempt to cut small pieces.
Do not handle blade guard. It is designed to self-retract.

- Follow these guidelines when working with Band Saws:
  - Make sure all guards are in place and properly adjusted. Ensure all band wheels are enclosed.
  - Adjust blade guard height to about 1/8 inch above the top of the material being cut.
  - Keep your hands on either side of the cut line. Never reach across the cut line for any reason.
  - Ensure the blade is tracking correctly and runs freely in and against the upper and lower guide rollers.
  - Ensure the blade is under proper tension.
  - Use band saw blades that are sharp, properly set and otherwise suitable for the job (e.g., the right tooth pitch; tooth form; blade width).
  - Hold stock firmly and flat on the table to prevent the stock from turning and drawing your fingers against the blade. Keep hands braced against the table.
  - Use a push stick when you remove cut pieces from between the fence and saw blade or when your hands are close to the blade. Keep your hands on either side of the blade - not in line with the cutting line and the blade.
  - If you hear a rhythmic click, do not use the saw and report the problem to shop staff.
  - Do not cut pieces that are too small to handle safely.
  - Keep hands at least 2” away from the blade.

- Follow these guidelines when working with Jig Saws:
  - Before you plug in the jigsaw, ensure the switch is in the off position.
  - Make any adjustments with the machine unplugged.
  - Secure the material you are cutting.
  - Do not force the work into the blade.
  - Do not use a bent blade or damaged blade.

- Follow these guidelines when working with the Metal Cutoff Saw:
  - Ensure nothing flammable will be in the path of cutting sparks.
  - Ensure the cutting blade is in good condition before starting the machine.
  - Securely clamp the material you are cutting.
  - Do not apply excessive downward force.
  - Let cutting wheel come to a complete stop before adjusting material.
  - Recently cut material will be very hot.

12. Metalworking Equipment Safety Rules

NOTE: Permission and training must be sought before operation of any of the metalworking tools listed below. Operation of any of the metalworking tools listed below without the proper authorization is a violation of the ABE shop policy.
12.1 Welding and Cutting

- Welding and cutting are two forms of hot work that require special safety considerations. Before conducting welding or cutting operations, inspect your equipment for the following:
  - Welding leads must be completely insulated and in good condition.
  - Check all other cords for frays and damages.
  - Cutting tools must be leak-free and equipped with proper fittings, gauges, regulators, and flashback devices.
  - Oxygen and acetylene tanks must be secured in a safe place.

- In addition, follow these guidelines for most welding and cutting procedures:
  - Conduct welding and cutting operations in a designated area free from flammable materials. When welding or cutting is necessary in an undesignated or hazardous area, have someone nearby act as a fire attendant.
  - Periodically check welding and cutting areas for combustible atmospheres.
  - Take care to prevent sparks from starting a fire.
  - Remove unused gas cylinders from the welding and cutting area.
  - Keep hoses out of doorways and away from other people. A flattened hose can cause a flashback.
  - Mark hot metal with a sign or other warning when welding or cutting operations are complete.
  - Always turn off the main valves on compressed gas cylinders when not in use.

12.2 Welding Guidelines

**NOTE:** The welders will always be padlocked in the off position. Permission and training must be sought before operating Welders

- Proper selection of personal protective equipment is very important when welding; make sure your welding helmet visor is dark enough to provide adequate protection. Wear fireproof apron and gloves. In addition, take care to protect other people from the hazards of welding.

- Common hazards associated with welding include the following:
  - Electrocution
  - Burns
  - UV radiation exposure
  - Oxygen depletion
  - Sparking

- In addition to the general guidelines for welding and cutting, follow these specific guidelines for safe welding operations:
  - Make sure the welding area has a non-reflective, noncombustible surface.
  - Ensure that adequate ventilation and exhaust are available.
o Be aware of electrocution hazards, particularly in damp conditions. Be sure that electrical cords are properly grounded. It is advisable for cords to pull down from an overhead pulley.

o Always turn off the main valves on compressed gas cylinders when not in use.

12.3 Cutting Guidelines

NOTE: The plasma cutter and torch will always be padlocked in the off position. Permission and training must be sought before operating the Plasma Cutter or Torch

- Gas welding and cutting tools are often powered by oxygen or acetylene gas cylinders. These tanks require special safety precautions to prevent explosions and serious injuries. Follow the safety guidelines below:
  o Store acetylene bottles upright and secured.
  o Keep cylinder fittings and hoses free from oil and grease.
  o Repair or replace defective hoses by splicing. Do not use tape.
  o Do not tamper or attempt to repair cylinders, valves, or regulators.
  o Do not interchange regulators or pressure gauges with other gas cylinders.
  o Carefully purge hoses and torches before connecting a cylinder.
  o Set acetylene pressure at or below 15 psig. Always use the minimum acceptable flow-rate.
  o Never use a match to light a torch. Use an approved lighter.
  o Always turn off the main valves on compressed gas cylinders when not in use.

12.4 Metal Lathe Safety

NOTE: The metal lathes will always be padlocked in the off position. Permission and training must be sought before operation

- Locate and ensure you are familiar with the operation of the ON/OFF starter
- Ensure all guards are in place.
- Check that the job is clamped tight in the chuck.
- Remove all tools from the bed and slides of the machine.
- Ensure correct speed for machining process is selected.
- Do not try to lift chucks or face plates that are too heavy for you.
- Never leave the lathe running unattended.
- Before making adjustments or measurements switch off and bring the machine to a complete standstill.
- Do not attempt to slow/stop the chuck or revolving work by hand.
- Avoid letting swarf build up on the tool or job. Stop the machine and remove it.
- Always remove the chuck key from the chuck.
- Do not store tools and parts on top of the machine.
12.5 Milling Machine Safety

**NOTE:** The milling machines will always be padlocked in the off position. Permission and training must be sought before operation

- Do not make contact with the revolving cutter.
- Use the buddy system when moving heavy attachments.
- Do not attempt to tighten arbor nuts using machine power.
- When installing or removing milling cutters, always hold them with a rag to prevent cutting your hands.
- While setting up work, install the cutter last to avoid being cut.
- Never adjust the workpiece or work mounting devices when the machine is operating.
- Chips should be removed from the workpiece with an appropriate brush.
- Shut the machine off before making any adjustments or measurements.
- When using cutting oil, prevent splashing by using appropriate splash guards. Cutting oil on the floor can cause a slippery condition that could result in operator injury.

12.6 Horizontal Metal Band Saw Safety

**NOTE:** Permission and training must be sought before operation of the Metal Bandsaw

- Check that all guards are in position.
- Ensure the hydraulic damping mechanism functions.
- Check that the blade is in good condition.
- Ensure that blade speed, blade tension and blade tracking are properly adjusted.
- Check coolant delivery system to allow for sufficient flow of coolant.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Lift the head of unit up and lock it in the upward position.
- Set the angle of the vice, or check it to ensure its squareness.
- Clamp work piece firmly into the vice. Long material must be supported.
- Ensure hands are away from the blade, and then turn the machine on.
- Allow the upper head assembly to come down slowly until the teeth are cutting the material.
- Keep hands away from the point of operation during cutting.
- Turn off the machine and bring it to a complete standstill if the blade is to be lifted out of an uncompleted or jammed cut.
- Stop the machine and bring it to a complete standstill before removing scrap pieces from the vice area or making adjustments.
- Stop the saw immediately if the blade develops a ‘click’. Report it to the shop staff.
- Ensure the cutting head is locked in the upward position before removing work piece from vice.
12.7 Scotchman Ironworker Safety

NOTE: The Ironworker will always be padlocked in the off position. Permission and training must be sought before operation of the Ironworker.

- Shutdown the machine when changing punches, dies, blades, or shims.
- Never try to grab a piece as it is being cut. Remove small pieces from the blade area with a hook, never your fingers.
- Turn the main power off when leaving the machine unattended.
- Never put your hands near a Hazardous area or Pinch Point, if a part is too large to sit on the ironworker table without your assistance, only hold the part if your hands are completely off the ironworker table and no body part could be susceptible to injury.
- Never put material in from the back-side of the shear. Always cut from the table side making sure the material is under the hold-down.
- Don't attempt to shear off a piece of material shorter than its thickness.
- Don't cut pieces that have less than ½" under the hold-down.
- Do not attempt to punch material thicker than the diameter of the punch.

12.8 Sheet Metal Shear Safety

- Keep hands away from shearing area.
- Get help from another person when handling large metal sheets.
- Do not cut material thicker than 16 gauge.

12.9 Sheet Metal Brake Safety

- Always clamp material before bending.
- Get help from another person when handling large metal sheets.
- Do not bend material thicker than 16 gauge.

13. Hydraulic Equipment Safety Rules

Note: Hydraulic systems store fluid under very high pressure. The high pressure spray of fluid can cause injection of fluid into the skin, and burns from the hot fluid.

- Periodically check for oil leaks and worn hoses.
- Always lower hydraulic working units to the ground before leaving machinery.
- Before disconnecting oil lines, relieve all hydraulic pressure.
- Be sure all line connections are tight and lines are not damaged.
- Block up the working units when you must work on the system while raised.
- Never service the hydraulic system while the machine engine is running.
REFERENCES


