

Shop Safety Procedure



Equipment/Task Name:	IRONWORKERS
Equipment/Task Hazard Class:	4 http://ehs.yale.edu/forms-tools/tool-classification-matrix
Shop Name:	
Shop Hazard Class:	

Purpose

An ironworker can be used for punching, shearing, notching, bending and other metal fabrication functions. Ironworkers at Yale operate by applying hydraulic force to a moving center that moves within a frame in a simple, vertical path. It exerts force through shear blades, notcher, punch and die, or other tooling upon mild steel. Vertical travel of the moving center allows the operator to perform multiple operations without removing any adjacent tooling.

Hazards

As with all shop tools there are many potential hazards associated with their use and exposure. Iron workers are Class 5 tools (<http://ehs.yale.edu/forms-tools/tool-classification-matrix>). There are a number of particular hazards associated with the operation and use of iron workers.

Crushing and Shear Points – Severe crushing injuries or amputations can occur if an operator makes contact with any of the pinch or shear points this machine provides.

- Guard all pinch and shear points with fixed or adjustable guarding. Guards should be adjusted down to within 1/4-inch from the top of the material to the bottom of the guard (or stripper when punching). More modern machines are equipped with adjustable restrictors that surround the material in-feed areas and should allow just enough clearance for the material to enter.
- Beware of machines with automatic urethane hold-downs. These hold-downs, if not adjusted properly, also come down with many tons of force and can be hazardous pinch points.

Flying and Moving Parts – Flying or ejected parts from either the stock or the tooling can strike operators and other workers in the area. Furthermore, punches are hardened and will not bend as they collide with dies. If a punch is out of alignment, it is more likely to flake or even explode, causing serious harm to the operator.

- Ensure proper alignment of the punch and dies.
- Stay within rated punching capacities and applications (mild steel).
- When bending, ensure proper clearance is available and people are clear of the path.

Accidental Start – Unprotected foot pedals can also introduce the possibility of accidental cycling.

- Cover foot pedals to prevent accidental cycling.
- Keep others clear of the immediate area when using the tool.

Limitations
<ul style="list-style-type: none"> The ironworker is designed to punch or shear mild steel. Rating is usually based by tonnage at the punch station. The tool is designed for small fabrication shops with short production runs and applications for which tolerances are not critical.
Required Personal Protective Equipment
<ul style="list-style-type: none"> Refer to the Shop Safety Postings and instructions provided by the Shop Supervisor. Shop specific required PPE:
Required Training
<ul style="list-style-type: none"> Applicable Shop Rules <ul style="list-style-type: none"> Student Shop Rules (http://ehs.yale.edu/forms-tools/shop-rules-student-accessible-shops) Professional Shop Rules (http://ehs.yale.edu/forms-tools/guidelines-professional-shops) For Class 2 through 5 Student Shops, review and signing of the Yale University Shop/Tool Use Safety Agreement (http://ehs.yale.edu/forms-tools/shoptool-use-safety-agreement). Shop Supervisors or Instructors must evaluate the tool user based on successful demonstration of the Training Competencies listed below as applicable. <p><u>Training Competencies:</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Dress appropriately and wear appropriate personal protective equipment for the operation. <input type="checkbox"/> Understand the uses, limitation, and hazards of the machine. <input type="checkbox"/> Be able to dress appropriately and don correct personal protective equipment. <input type="checkbox"/> Know how to inspect the ironworker and adjust all components, including guards and hold-downs, for selected operation. <input type="checkbox"/> Identify and describe all controls, adjustments, and functions of the ironworker. <input type="checkbox"/> For punching, inspect the punch and die for condition and alignment. <input type="checkbox"/> Apply good judgment in selecting and positioning the work piece for the operation. <input type="checkbox"/> Students must be able to reset all functions and clean up in preparation for next user. <ul style="list-style-type: none"> Shop specific training requirements:
Authorized Tool Users
Shop Supervisor, Shop Monitors and those authorized by shop supervision to operate the tool.
Tool Safety Rules
<ul style="list-style-type: none"> Observe and follow all Yale Professional or Student Shop Rules as posted. Understand and follow manufacturer operating procedures. Inspect the tool for damage prior to use. Verify all guards are in place and adjusted properly. Do not bypass any safety devices. Always stay at the machine while it is running. Clean the tool after use. Report any malfunction or damage to the Shop Supervisor after tagging the tool "Out of Service, do not use". Only use one function at a time. Never operate any of the work stations from a sitting or kneeling position. Only one person can use the ironworker. People must NOT be used to support the work piece in any part of the operation. Any need to support the work piece must be achieved with the use of adjustable T-stands, material supports, or similar equipment aids. (See Diagrams/Illustrations Section)

Tool Safety Rules (cont'd)

- Never place hands near a hazardous area or pinch point. If a part is too large to rest on the ironworker table without physically holding the work piece, only hold it from a point that is completely off the table and away from the hazardous area.
- Never operate the ironworker with dull or damaged tooling.
- When shearing, always make sure that no one is behind the shear picking up metal.
- When punching, insure there are no body parts between the work and the direction of movement of the punch. Remember on the return stroke the metal will move upward.
- Never attempt to grab a work piece as it is being cut or punched. Remove small pieces from the blade or die using a hook or other similar tool.
- Ensure feet are completely clear of the pedal control(s) after each cut.
- Never attempt to shear off a piece of material that is shorter than its thickness.
- Never attempt to cut a piece of material that have less than ½" under the hold-down.
- Never attempt to punch material that is thicker than the diameter of the punch.
- Never process stacked material.
- Stay within rated punching capacities and applications (mild steel).
- When bending, ensure proper clearance is available and people are clear of the path.
- Note that some manufactures require periodic oiling of the blades and dies. Refer to the owner's manual or the Shop Supervisor for specific instructions.

Shop specific rules:

Proper Setup and Use

Prior to Use:

- Prior to Use
- Understand the operation of the tool and its limitations/capacity. See the Illustrations included with this Procedure.
- Verify the work piece material is safe and appropriate for the tool. Do not punch anything thicker than the diameter of the punch.
- Identify the hole, cutting, or bending location on the work piece and mark it.
- Identify the appropriate tooling needed for the task. Only tooling approved by the manufacturer and Shop Supervisor may be used. If needed, consult the Shop Supervisor on local policies and procedures to replace or install tooling.
- Inspect the punch securing nut, die, and stripper for condition, alignment and tightness.
- Remove all tools or other objects from the area that could affect the tool operation or create a trip hazard.
- Prepare for the operation by verifying that any loose clothing or jewelry has been removed or secured, and hair (including beards) is tied back.
- Don personal protective equipment.

At the Ironworker:

- Turn on the ironworker.
- Switch the tool to the desired function if applicable (Shear or Punch).
- With all body parts clear of the hazard areas and pinch points, depress the appropriate foot switch. Run the tool through a cycle to verify functionality and proper clearances.
- For Punching:
 - Place the material to be punched beneath the punch while keeping hands away from any pinch points.
 - Ensure both sides of the punch stripper are in contact with the work piece. Unbalanced forces due to contact on only one side of the stripper may cause punch breakage.

Proper Setup and Use (cont'd)

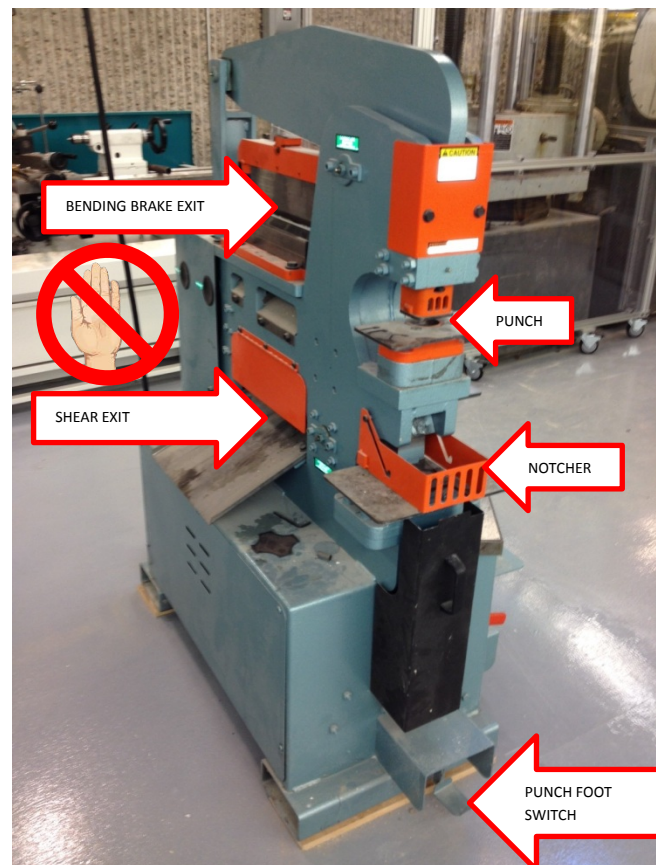
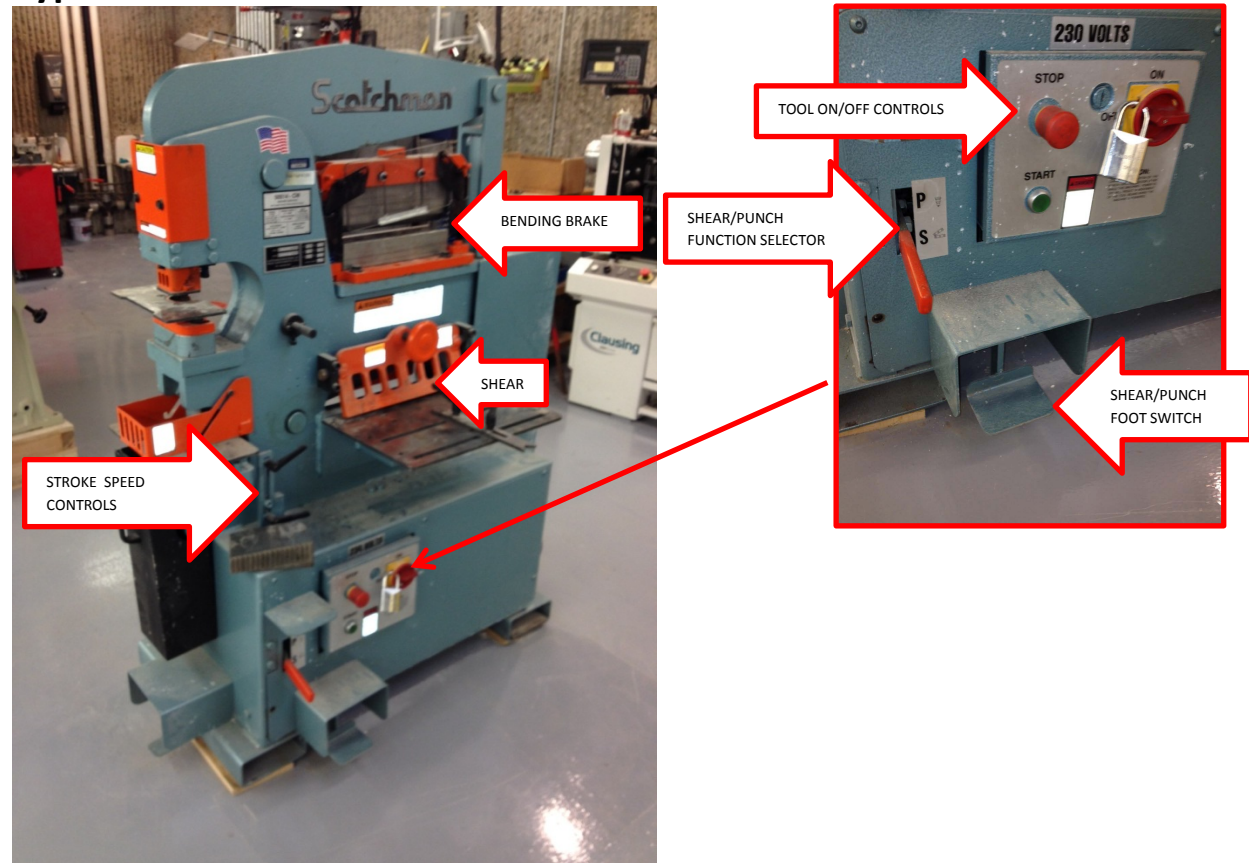
- With hands and fingers clear of the hazard areas and pinch points (including between the work piece and work surface), depress the foot switch completely.
- Punch full and complete holes, not partial holes. Attempting a partial punch can result in punch or die breakage due to the created side load force.
- Release the foot switch after the single operation is complete.
- Do not attempt to move the work piece or make adjustments unless the foot switch is completely cleared and the tool has completed the cycle.
- Ensure the slug drops from the shut after each stroke.
- For Shearing:
 - Place the material to be punched beneath the shear while keeping hands away from any pinch points. 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.
 - Do not shear parts that are too small to fit under the safety hold-downs.
 - With hands and fingers clear of the hazard areas and pinch points (including between the work piece and work surface), depress the foot switch completely.
 - Release the foot switch after the single operation is complete.
 - Do not attempt to move the work piece or make adjustments unless the foot switch is completely cleared and the tool has completed the cycle.
 - Ensure the slug drops from the shut after each stroke.
- For Bending:
 - Place the material to be bent between the bending dies while keeping hands away from any pinch points. Never put material in from the back-side of the ironworker. Always bend from the table side and ensure proper clearance is available and people are clear of the path on the feed and exit sides.
 - The materials must be placed on the center of the dies to prevent damage to the tool.
 - Hold short pieces with tongs or similar devices.
 - With hands and fingers clear of the hazard areas and pinch points (including between the work piece and work surface), depress the foot switch.
 - Release the foot switch after the desired bend is obtained.
 - Do not attempt to move the work piece or make adjustments unless the foot switch is completely cleared and the tool has returned completely to the open position.

Completion:

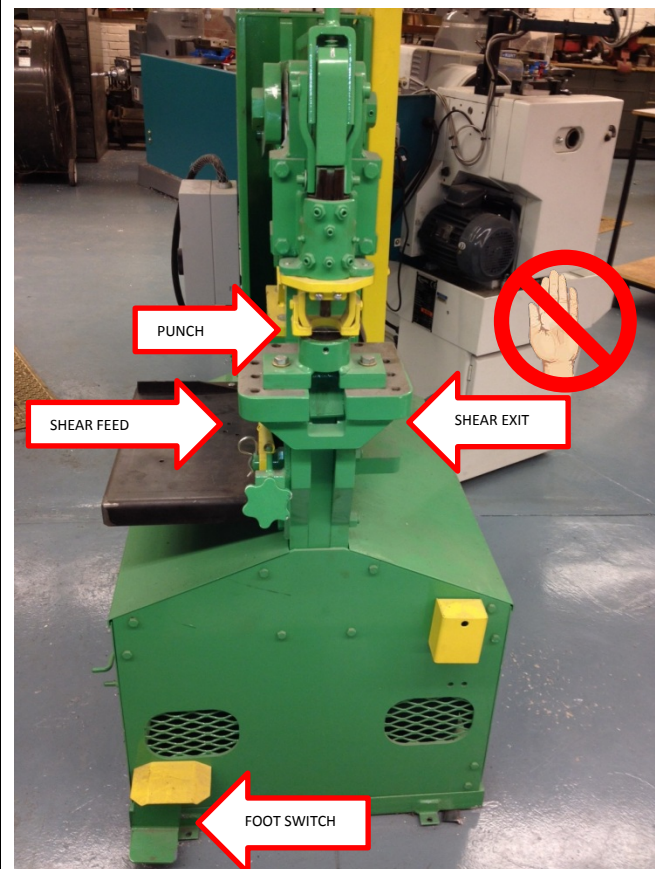
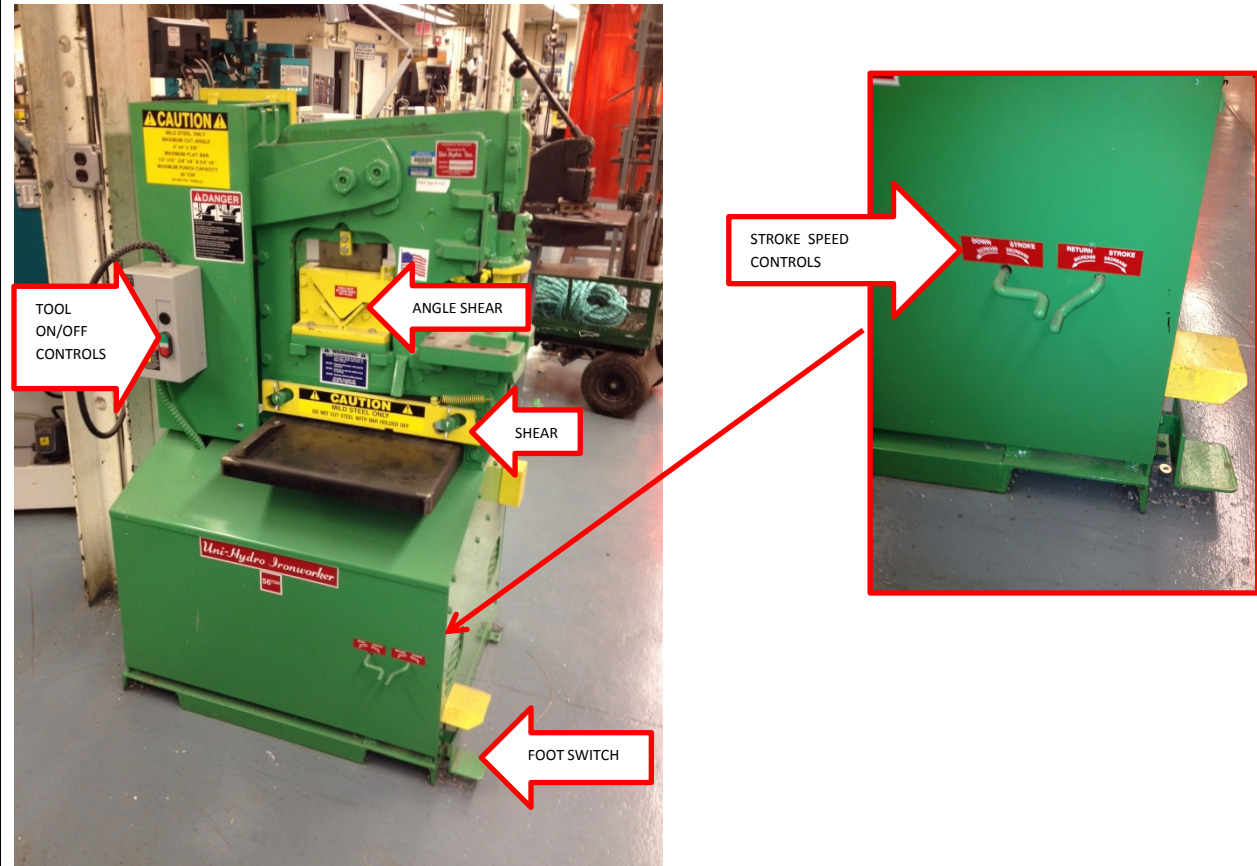
- Remove the work piece. Beware of sharp edges and potential burrs.
- Turn off the ironworker.
- Clean up the ironworker and work area for the next user.
- Report any issues to the shop supervisor.

Shop specific procedures:

Typical Scotchman Ironworker



Typical Uni-Hydro Ironworker



Example of an adjustable T-Stand



Creation/Revision Dates:

Suggestions, questions, or comments? Please contact your shop supervisor or EHS.