

METALWORKING
SAFETY INSTRUCTIONS

INDUSTRIAL ARTS

SAFETY INSTRUCTIONS

METALS

FOREWORD

Safety instruction is an important and integral part of today's Technical Education curriculum. Good safety habits, practices, and attitudes can best be acquired through a carefully planned and implemented safety education program. The Beaverton School District also strives to provide machine guarding that meets OR-OSHA requirements. Our teaching staff will strive to enforce all established safety rules.

The safety instructions and tests in metals were developed by Beaverton Industrial Arts teachers in 1978 and revised in 1981. They were reviewed and updated during the 1991-92 school year by teachers Will Thomas and John Cramer and Risk Management Specialist Dan Thomas.

The safety information in this manual should be recognized as a vehicle for establishing a safety program and for building strong, positive attitudes toward safety and is a mandatory part of the Technical Education, Industrial Arts program.

Beaverton School District #48

TABLE OF CONTENTS

SAFETY INSTRUCTIONS

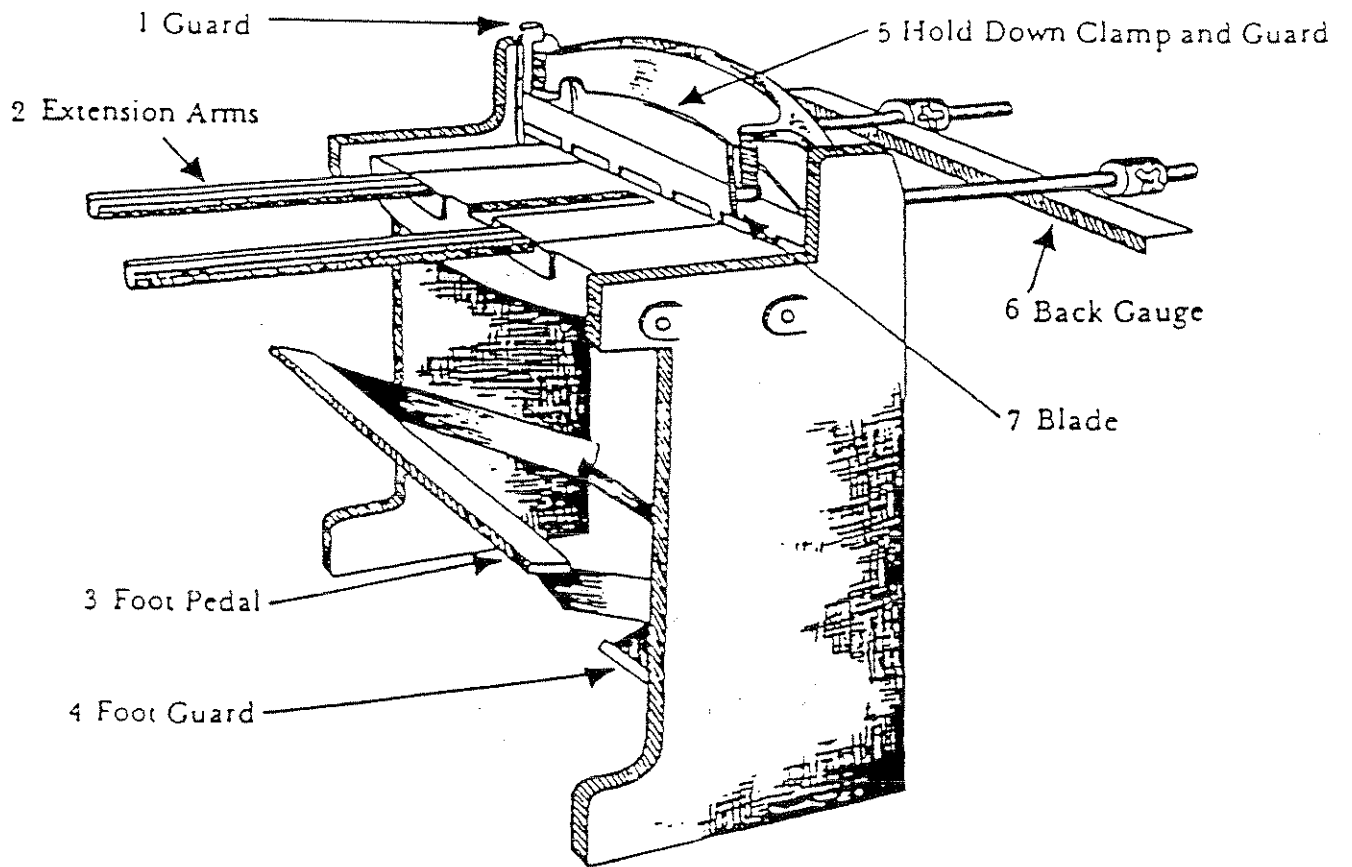
METALS

1. General Safety
2. Metal Squaring Shear
3. Portable Drill
4. Drill Press
5. Oxy-Acetylene Welding
6. Electric Arc Welding
7. Foundry
8. Gas Forge
9. Bench-Pedestal Grinder/Wire Wheel-Belt Grinder
10. Buffer
11. Bandsaw--Vertical and Horizontal
12. Metal Lathe
13. Milling Machine
14. Portable Disc Grinder
15. Metal Cut-Off Saw (Abrasive Chop-Saw)
16. Precision Grinding Machine
17. Gas Arc Welding (TIG and MIG)

GENERAL SAFETY

1. There are safety instructions and safety tests for all machines. Students must pass the safety test on each machine with 100% accuracy before they use the machine.
2. Do not operate any machine until you have received instructions on it, fully understand how to operate it, and have the teacher's permission.
3. Learn procedures to follow in case of fire or accidents. Safety equipment is not to be abused because it could save a life.
4. Compressed air can be very dangerous. A student using compressed air must wear eye protection and work in a way as not to blow air, dust, liquids or scraps toward himself or anyone else. Compressed air is NOT to be used to clean clothing or people.
5. Any metal that has been worked (e.g., sawed, ground, machined, welded) should be considered sharp and/or hot and must be handled with care.
6. Machines are not to be operated while the teacher is out of the room.
7. Adjustments and measurements must be made when the machine is at a dead stop.
8. Be sure the switch is in the "off" position and guards are in place before you "plug in" the electric cord.
9. Start and stop your own machine and remain with it until it has come to a dead stop.
10. Give your work your undivided attention while you are using machines. Do not look away or talk to others.
11. All work areas including machines, benches, and floors must be kept clear of scraps and unused materials.
12. Notify your teacher of any tool or machine that is out of adjustment or broken and do not use them until repaired.
13. You will be held responsible for vandalism.
14. Report immediately any injury or accident, regardless of how minor, to the teacher.

METAL SQUARING SHEAR

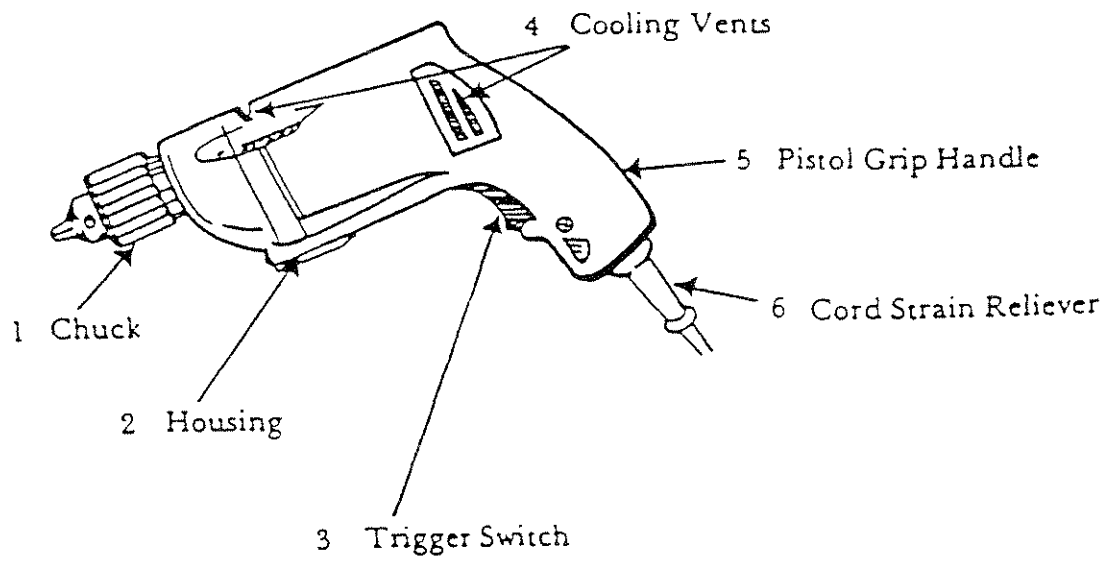


Beaverton School District #48
Safety Instructions
Metals

METAL SQUARING SHEAR

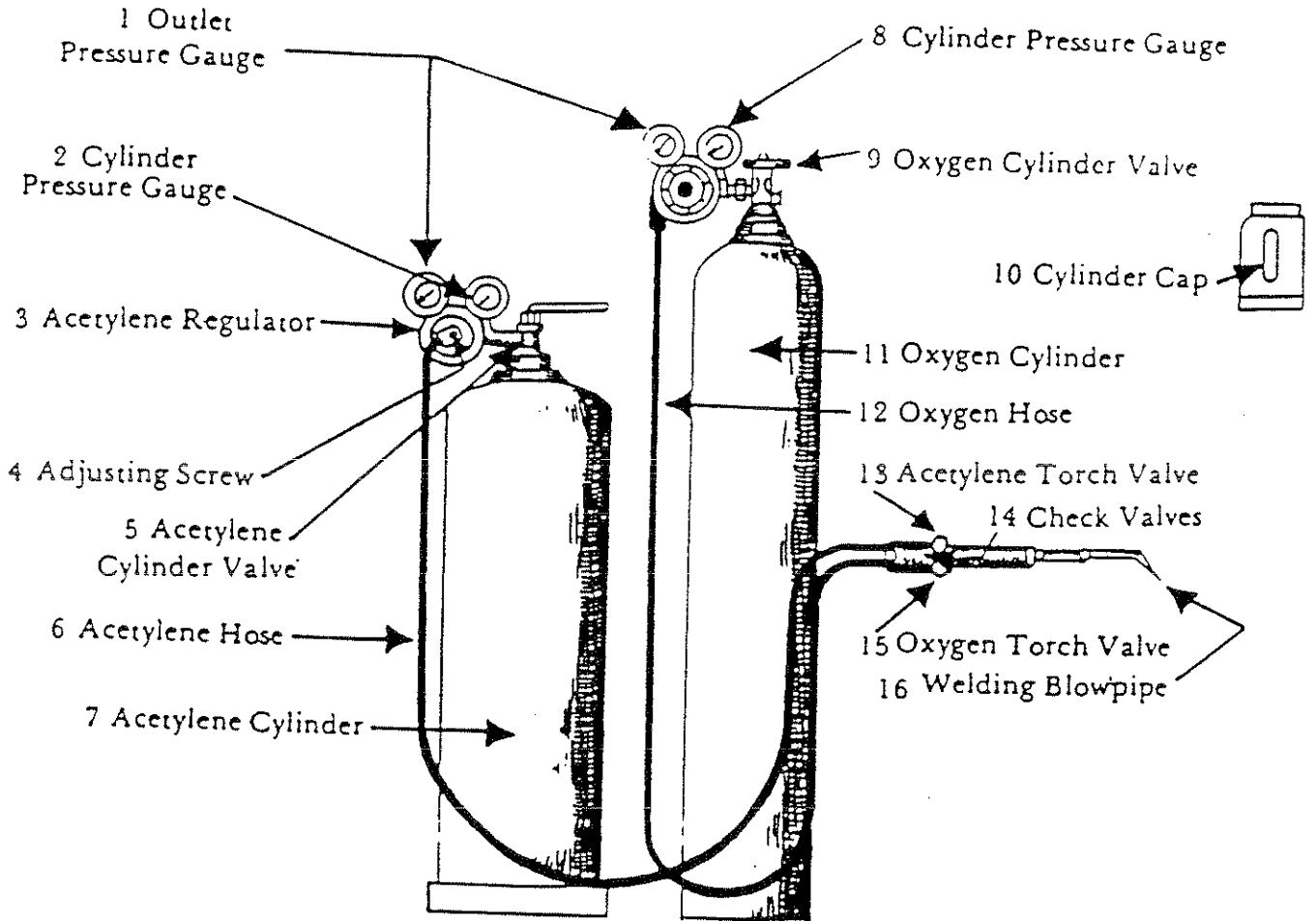
1. Feed and operate from the operator's position, never from the back.
2. Always keep your fingers at least 4 inches away from the pressure bar and blade.
3. Allow all pieces of metal to drop; do not attempt to catch them.
4. Remove burrs before working; leather gloves are required for handling large pieces of sheet metal.
5. Place scraps or trimmings in metal waste container and return machine to normal position.
6. Teacher assistance is required if the operation needs more than one person to complete the cut.

PORTABLE DRILL



DRILL PRESS

1. Never leave a chuck key in the chuck. If the power is turned on, the key will be thrown out and may injure someone.
2. All work pieces must be secured with a clamp or similar device when drilling.
3. If the work is caught by the drill, turn off the power and stand clear. Do not try to stop it by hand.
4. Make sure the drill bit is sharp.
5. Large drill bits should turn at slow speeds.
6. Some operations require special equipment and instruction, ask your teacher for help if you have any questions.
7. Loose clothing, unsecured long hair that is not tied back, and accessories may cause accidents around machinery. Tuck in loose clothing and secure long hair. Loose jewelry is not permitted when using machines.
8. Ease up on feed pressure when drill begins to break through the material. This is when the drill bit will bind and can break or grab.
9. Use only a brush to remove chips and shavings and only when machine is at a dead stop. **DO NOT USE COMPRESSED AIR.**
10. Do not attempt to remove a burr on a hole with fingers; use a larger drill, countersink, or deburring tool.



Beaverton School District
Safety Instructions
Metals

OXY-ACETYLENE WELDING

1. Extreme caution must be used when moving portable carts. Make sure compressed gas cylinders are secured with safety chain.
2. Report any leaking of cylinders or connections to the instructor immediately. Acetylene gas is explosive.
3. Always consider metal found in the welding areas to be HOT! Use extreme caution while taking metal to quenching tank.
4. Always release regulator pressure screws before opening cylinder valves; stand to one side and open valves slowly.
5. Keep all combustible materials such as cardboard, rags, unsecured long hair and flammable liquids away from the work area.
6. Open acetylene cylinder valve 1/4 to 1/2 turn.
7. Keep acetylene pressure below 15 lbs. p.s.i.
8. To light torch, use a friction lighter, never an open flame.
9. Make sure lighted torch always points away from yourself or others.
10. Keep sparks and flame away from cylinders and hoses.
11. Close acetylene torch valve first when operation is complete.
12. Avoid steam burns when cooling hot metal in water.
13. Welding galvanized metals requires special supervision from the instructor.
14. Do not weld or cut on fuel tanks, cans, or barrels without instructor approval.
15. Do not cut or weld material while it is lying on a concrete floor. Excessive heat can cause the floor to explode.
16. Make sure that the ventilation system is working; do not breathe fumes.

Beaverton School District #48
Safety Instructions
Metals

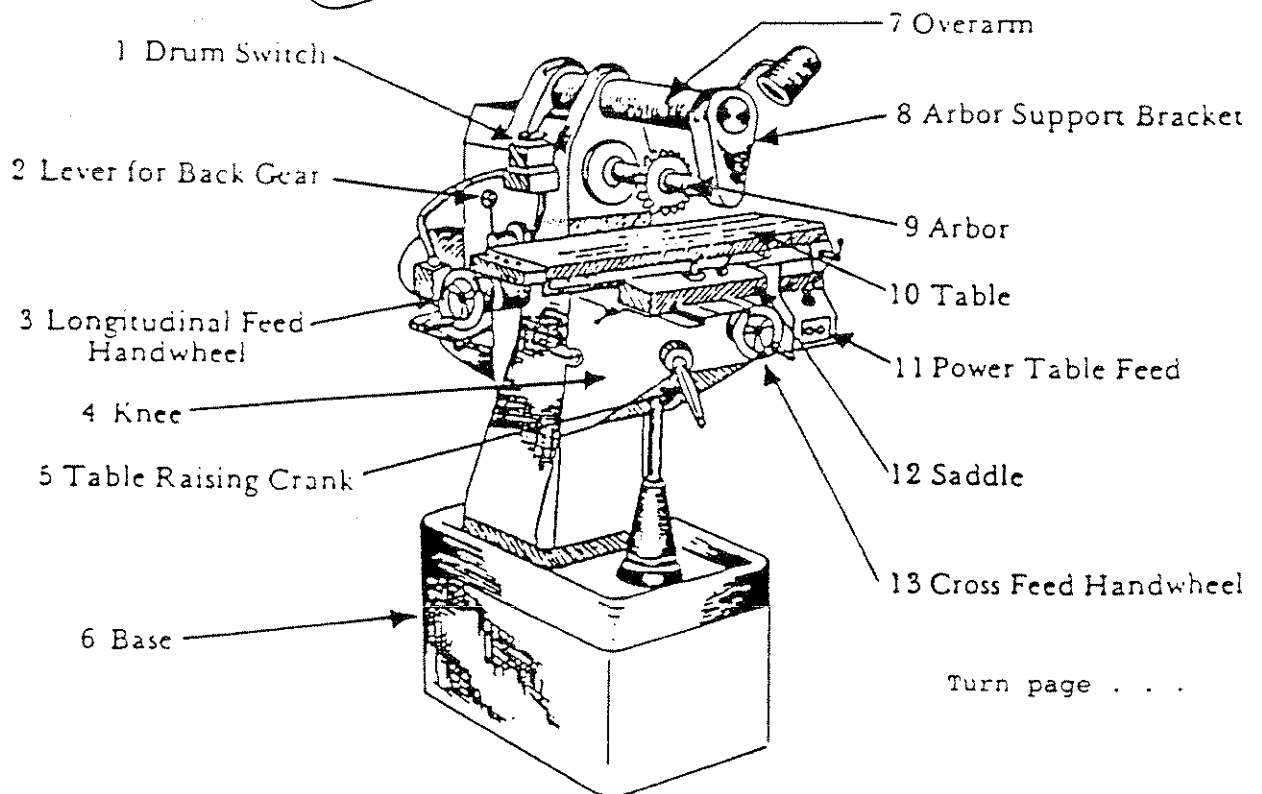
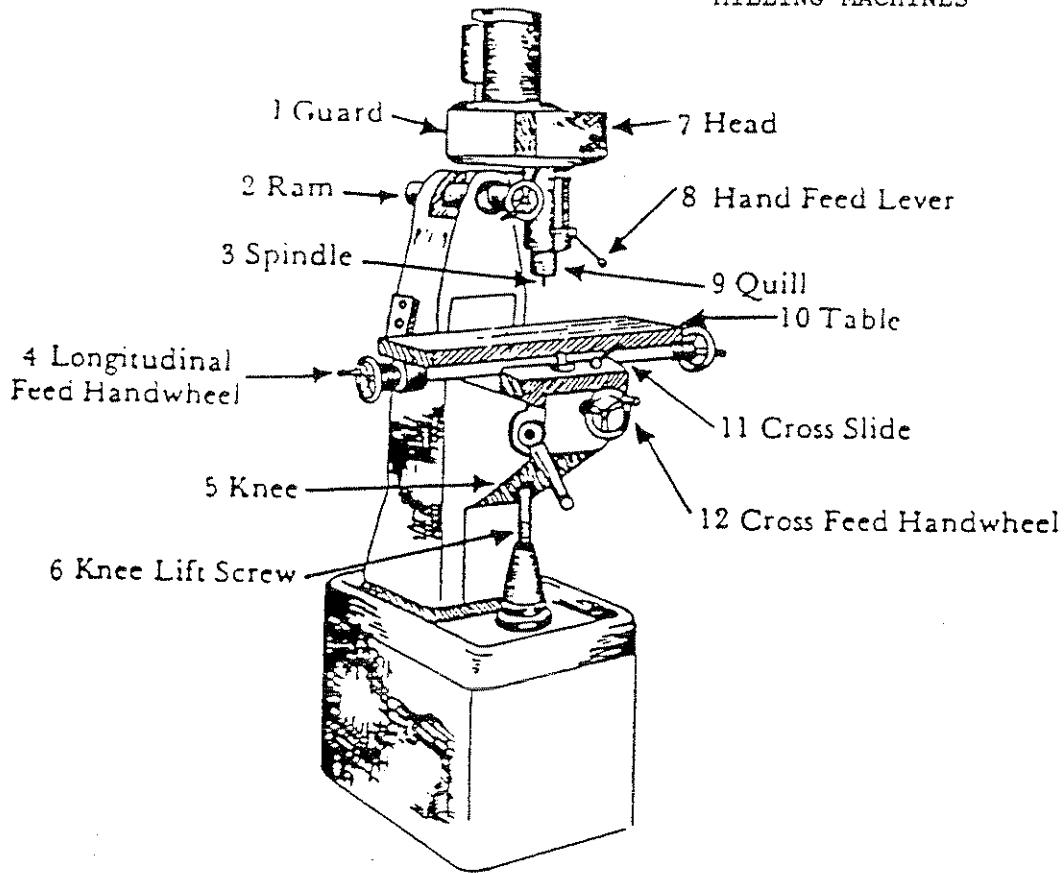
ELECTRIC ARC WELDING

1. Wear a helmet with at least a number 10 shade lens, gloves, long sleeved coat, and leather leggings.
2. Make sure electric welding is done only in a correctly constructed booth or behind a proper screen.
3. Keep all combustible material such as cardboard, rags, unsecured long hair and flammable liquids away from working area.
4. Turn off welder when work is being changed or when work has been completed.
5. Never weld when water is present on the floor in the welding area.
6. Treat all metal, tools, tables, and equipment as if they were HOT. Use extreme caution while taking metal to the quenching tank.
7. Use pliers or similar tool for picking up hot metal; not gloves.
8. Avoid steam burns when quenching hot metal by keeping exposed skin well away from quenching water.
9. Be careful of electrical shock or accidental arc between the electrode holder, work piece, table, or ground clamp.
10. Report any malfunction of machine to your instructor (hot leads, electric shorts, noises, etc.).
11. Do not weld on fuel tanks. Do not weld on cans, or barrels without instructor approval.
12. Protect others when welding and chipping. Use barrier shields to prevent arc flashing into other's eyes.
13. Position cables so that they are not pinched, bent over sharp edges, or touching hot metal.
14. When electrode sticks, do not raise helmet until circuit is broken (release electrode from holder if necessary).
15. Make sure that ventilation system is operating; do not breathe fumes.
16. Wearing of contact lenses while arc welding is prohibited. Serious eye injury may result.

Beaverton School District #48
Safety Instructions
Metals

GAS FORGE

1. All metal or tongs near the gas forge should be considered as hot; use leather gloves at all times when handling them.
2. Lighting the gas forge must only be done by the instructor after it is purged with the lid open.
3. Use tongs to handle hot metal. Use extreme caution while taking metal to quenching tank.
4. Avoid steam burns when quenching hot metal by keeping exposed skin well away from quenching water.
5. Metal screen face shield must be worn over safety glasses while working at the forge.
6. Hot metal left unattended must be marked "HOT" with chalk or kept in a storage place marked "HOT".
7. Hammering on the anvil is permitted only when forging material.

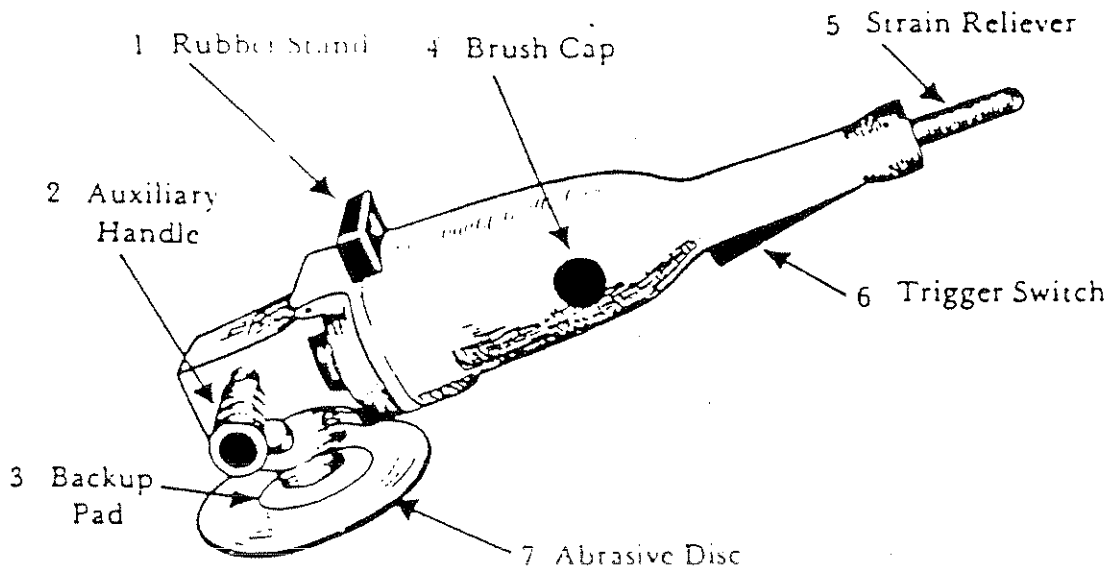


Turn page . . .

MILLING MACHINES

1. Remove spindle wrench ~~im~~mediately after securing bit in collet.
2. Be sure the work piece is fastened securely in vise or indexing head.
3. Check and set proper speed, feed, and depth of cut.
4. Keep hands and fingers at least six inches away from the rotating cutter and the work piece.
5. Handle all cutters carefully (cutting edges are sharp).
6. Use a brush to remove chips from work when machine is at a dead stop. Do not use compressed air.
7. Keep floor clean around milling machine.
8. Wear a face shield or have the machine chip shield between you and the work peice while cutting.
9. Before leaving the milling machine you must turn off the power, brake it to a dead stop, and remove the cutter.
10. Face shields must be worn during operation of this machine.
11. Loose clothing, unsecured long hair that is not tied back, and accessories may cause accidents around machinery. Tuck in loose clothing and secure long hair. Loose jewelry is not permitted when using machines.

PORTABLE DISC GRINDER



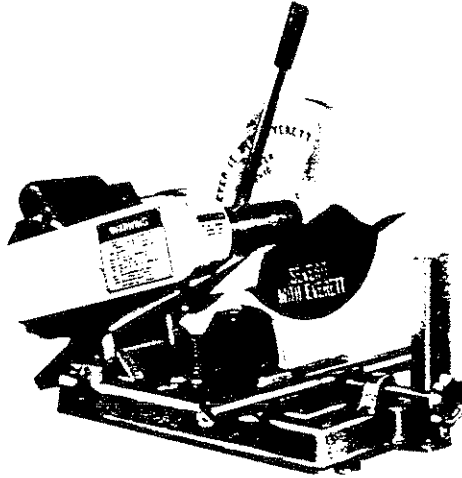
Beaverton School District #48
Safety Instructions
Metals

PORTABLE DISC GRINDER

1. Electrical shock may result from using the portable grinder in damp or wet locations.
2. Grinding is permitted only when done a safe distance away from observers in an appropriate area. Sparks, grit, and bits of metal will fly off of work piece and can injure others.
3. Don't overload the portable grinder since that might cause the disc to shatter. It will do the job better and safer at full speed.
4. Loose clothing, unsecured long hair that is not tied back, and accessories may cause accidents around machinery. Tuck in loose clothing and secure long hair. Loose jewelry is not permitted when using machines.
5. Keep electrical cords away from the spinning disc or grinding wheel.
6. Secure work firmly.
7. Hold portable grinder securely with both hands while operating. When finished, do not set the grinder down until it comes to a dead stop.
8. Disconnect the power cord before changing the disc or wheel.
9. Make sure switch is in the "off" position before plugging in the portable disc grinder.
10. Never allow sparks to fly toward flammable liquids or combustible material such as cardboard, rags, unsecured long hair and flammable liquids.
11. A face shield must also be worn when operating the disc grinder.

Beaverton School District #48
Safety Test
Metals

METAL CUT-OFF SAW (ABRASIVE CHOP-SAW) 15



Turn page . . .

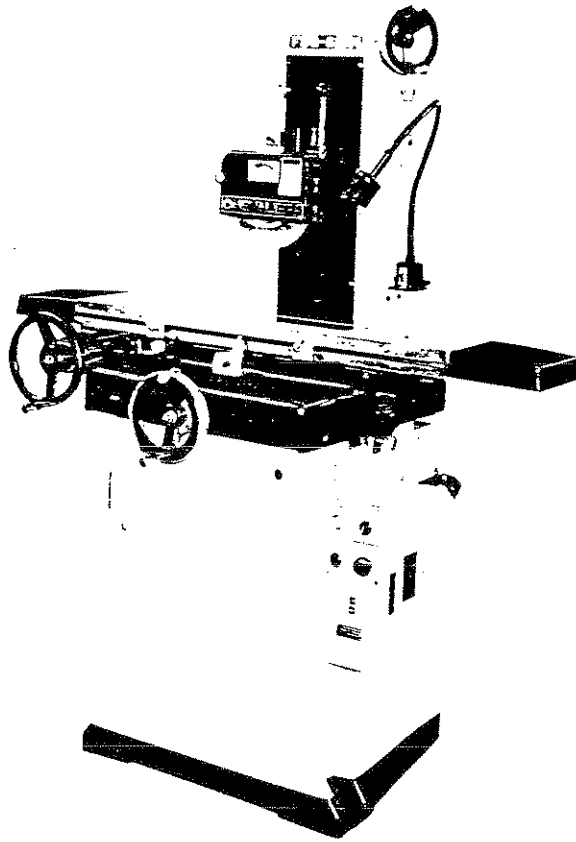
METAL CUT-OFF SAW
(ABRASIVE CHOP-SAW)

1. Test the cut-off wheel for cracks by using the "ring" test before mounting it. Ask your instructor for directions.
2. Mount abrasive wheel with blotters between it and the recessed flanges.
3. Make certain the recessed flanges are equal in diameter and designed for the abrasive cut-off saw.
4. Tighten the spindle nut only enough to hold the wheel securely. Never over tighten.
5. Allow abrasive wheel to reach full RPM before starting cut.
6. Do not cut material that is thicker than capacity of machine.
7. Do not overheat the wheel. Pull it through material in a slow, careful manner.
8. Keep floor area around the metal cut-off saw clear of scraps and wipe up any coolant spills.
9. Make measurement with the machine at a dead stop.
10. Always clamp material against fence, no free hand cuts.
11. A face shield must also be worn when operating the metal cut-off saw.
12. Loose clothing, unsecured long hair that is not tied back, and accessories may cause accidents around machinery. Tuck in loose clothing and secure long hair. Loose jewelry is not permitted when using machines.

Beaverton School District #48
Safety Test
Metal

PRECISION GRINDING MACHINES

16



Turn page . . .

PRECISION GRINDING MACHINES

1. Wear safety glasses and a face shield.
2. Make adjustments (other than depth of cut) and measurements only when the machine is at a dead stop.
3. Have instructor check a wheel for cracks or damage before installing it.
4. Never operate wheels above the recommended RPM.
5. Use a safety shield to prevent metal from being thrown out into a traffic area.
6. Your instructor MUST check all setups before start-up.
7. Make sure that the wheel is the proper type and clear of the work before starting the machine.
8. Run through one cycle by hand before engaging automatic feed (if applicable).
9. Do not allow the wheel to become glazed or loaded.
10. Use proper type and amount of coolant (if applicable).
11. Check the work to see if it is solidly held in or on the chucking device.
12. Do not lay tools on the machine.
13. Return machine to normal and return all tools and equipment to the proper storage place.
14. Do not leave the machine until it has come to a dead stop.
15. When using magnetic chuck, the base of the work piece should be as wide as or wider than the piece is high.
16. When dressing the wheel, position the dresser so that it won't be pulled into the wheel.
17. Disengage manual controls before using automatic or power feed.
18. Loose clothing, unsecured long hair that is not tied back, and accessories may cause accidents around machinery. Tuck in loose clothing and secure long hair. Loose jewelry is not permitted when using machines.

GAS ARC WELDING (TIG AND MIG)

