

**LOS ANGELES UNIFIED SCHOOL DISTRICT**  
**DIVISION OF ADULT AND CAREER EDUCATION**  
**SAFETY MANUAL FOR INDUSTRIAL EDUCATION**  
**WELDING**

TABLE OF CONTENTS

1) THINK SAFETY .....AND PASS THE SAFETY TEST .....	2
2) REPORT TO YOUR INSTRUCTOR WHENEVER: .....	2
3) ASK YOUR INSTRUCTOR'S PERMISSION BEFORE:.....	2
4) WEAR PROTECTIVE CLOTHING.....	3
5) LIFTING AND CARRYING SAFETY.....	3
6) PREVENT FIRE AND BURNS.....	4
7) HAND TOOLS AND BENCH WORK .....	4
8) GENERAL SHOP SAFETY GUIDELINES:.....	5
9) PORTABLE POWER TOOL SAFETY .....	5
10) GENERAL WELDING SAFETY PRACTICES.....	6
11) OXYGEN-ACETYLENE WELDING .....	6
12) ARC WELDING SAFETY.....	8
13) SPOT WELDING SAFETY .....	9

## GENERAL SAFETY INSTRUCTIONS

### 1) THINK SAFETY .....AND PASS THE SAFETY TEST

- a) You are individually responsible for putting safety first. Be ready and willing to learn how to work safely. Your life or the lives of others may be at stake! More accidents are caused by unsafe acts of people than by unsafe conditions.
- b) Before working with any machine, equipment, or tool, you must receive safety instructions, pass the safety test, and be sure that an instructor is present in the shop.
- c) Look for, read, and obey all the warning signs posted in the shop that are placed there to call your attention to possible dangers.
- d) Become familiar with the school's fire signal, fire drill procedures, and fire exits. In case of fire alarm, turn off all power and flames and walk quietly to the nearest exit. Follow the instructor's directions.
- e) Never remove guards of safety devices from any machine. They always must be used. If, for any reason, a safety guard is removed, or if the machine is defective in any way, the machine must not be used until proper authorities make corrections.

### 2) REPORT TO YOUR INSTRUCTOR WHENEVER:

- a) Any student, including yourself, feels ill or has even the slightest injury, accident, burn, or electric shock.
- b) You see anyone breaking a safety rule, such as clowning, running, snapping rags, playing around, or otherwise acting in an unsafe manner. A playful push may cause a fall and injure someone.
- c) You find a faulty tool, questionable equipment, or a safety guard removed from a machine. Report any machine out of adjustment or in need of repair, or any other unsafe shop condition. Take damaged or broken tools to your instructor. Tag the tool as unsafe. Report any machine that does not operate correctly.

### 3) ASK YOUR INSTRUCTOR'S PERMISSION BEFORE:

- a) Using any power machine or test equipment. You are permitted to work with machines and equipment only after you have been given safety instructions. Every machine is dangerous if operated incorrectly. You must be instructed in safe operation.
- b) You are not permitted to work with any machine or equipment before, during, or after class hours unless you have received permission and there is an instructor in the shop or project area. Should you or any other student get injured, report it to the instructor immediately.
- c) Do not use any shop made jigs, without the instructor's permission.
- d) Using any materials at the school or project location.

#### 4) WEAR PROTECTIVE CLOTHING

- a) **It is mandatory to wear safety goggles or a face shield** in the Welding project area to protect your eyes and face from sparks, flames, blinding light, solvents, soldering fluxes, chemicals, dust or chips from materials, or other equipment. California law states that "Eye protective devices shall be worn...while repairing or servicing any project or operating any machinery or equipment."
- b) Wear properly fitted clothing. All loose clothing and hair should be tucked out of danger from being caught in wheels, drive belts, or gears. Do not wear ties, scarves, dangling chains, or jewelry in the shop. These can get caught in machinery.
- c) Wear solid shoes rather than sandals or sneakers. They protect your feet from falling objects or floor litter and sparks. To prevent slipping, shoes should have full tops and rubber soles and heels in good repair. Shoes with worn soles are dangerous if the wearer steps on a sharp or hot object.
- d) Wear gloves during welding and handling hot objects.
- e) Do not wear gloves when using the bench grinder or pedestal grinder.

#### 5) LIFTING AND CARRYING SAFETY

- a) Grasp any object to be lifted with a firm grip and lift with your legs, not with your back. Squat down and keep your back and head in as straight a line as possible when you lift. Keep your back vertical and use your leg muscles for lifting.
- b) Get help with long or heavy objects. Make sure the path to where you are moving the object is clear. Clear the path from the area where the object is located to the area where it is to be set down.
- c) Do not twist your body when moving or carrying things.
- d) Carry long pieces of material very carefully. Good safety practice requires that students must be at each end when carrying long pieces of material (six feet or more). Two students carrying the long piece of material should carry the material on the same side of their shoulders.

## **6) PREVENT FIRE AND BURNS**

- a) Remember there are flammable materials around the weld shop. There must be NO smoking in the work area.
- b) In the case of fire, follow only your instructor's directions. Know and practice the fire drill rules. Locate the exits.
- c) Never use or operate any equipment that generates sparks and flames near any flammable or combustible materials. Keep all used rags, especially those used to contain any combustibles, in covered metal containers.
- d) Never use gasoline or propane near flames or potential sparks.
- e) Be careful when picking up metal tools and other equipment that has been sitting in the sun or has been used. It might be hot and could cause a burn.
- f) When welding or brazing, set up the work so that the flames from the torch will not come in contact with the concrete floor. Cement will explode under high heat.
- g) Keep hands away from open flames, hot metal, drill bits, saw blades, and any other hot objects that could result in a burn.
- h) Do not use paint, enamel, lacquer, or solvents near flames or sparks.

## **7) HAND TOOLS AND BENCH WORK**

- a) Use the right tool for the right job. Each tool is made to do only certain jobs with safety and ease. Using any available tool to "get by" is one of the main causes of hand tool accidents. Do not, for example, use a wrench as a hammer or a screwdriver as a chisel or pry bar. Use only tools that are in safe condition. Report any unsafe tools to the instructor.
- b) Do not throw tools or materials to another student. Pass tools directly with handles extended.
- c) Do not leave tools or materials projecting from a vise or workbench. Other students can bump into them.
- d) Make sure that handles are used on files, chisels, and scrapers. Do not carry sharp-edged tools in your pockets. Objects can cut hands or puncture body parts during a fall.
- e) Don't invite hand or finger laceration by carelessly handling sharpened tools or by sliding your hands along the edges of sheet metal. Use gloves when handling sheet metal because it has razor-sharp edges and burrs along the edge.
- f) Do not strike two hardened surfaces together, such as hammer heads or a hammer and anvil face against each other. When hard steel strikes hard steel, a sharp piece of one of the surfaces may break away. Do not use a chisel or punch if the end has mushroomed. Pieces might break away.
- g) Hold a chisel firmly when hitting it with a hammer. Keep fingers away from cutting edges and never test the edge of the blade by drawing fingers across it.

## **8) GENERAL SHOP SAFETY GUIDELINES:**

- a) Keep the floor, aisles, and passageways clear of stock, materials, scraps, tools, equipment, hoses, and cords. Place all scrap material or cuttings in the scrap box provided.
- b) Clean up immediately any liquids or grease spilled on the floor to prevent slips and falls and to reduce fire danger.
- c) Use low-pressure nozzles and do not blow compressed air onto your body to clean off clothes or body parts or for any other reason. Never point an air nozzle at anyone, nor attempt practical jokes with it. It may break an eardrum, blow foreign matter into an eye, or cause other injury. Use OSHA approved air nozzles.
- d) Do not place articles on ladders or other high places where there is danger of them falling on someone.
- e) Always keep your mind on your work. Not paying attention may result in a serious accident.

## **9) PORTABLE POWER TOOL SAFETY**

- a) Obtain the instructor's permission before turning on any power tools or equipment. Do not use any power tool while standing on a wet or damp floor.
- b) Use extension cords carefully. Inspect the condition of the cord, cap, and body and be sure that insulation and covering are not broken or worn. Be sure your hands are dry before touching switches or receptacles. Wet hands invite electrical conduction and can cause shocks or burns from electricity.
- c) Before turning on the power to any tool, pick up loose tools and materials around the power tool and make certain that all other students are clear of the machines and equipment. Clean, oil or adjust machinery only when the machine is stopped. Unplug the machine or disconnect the breaker in the fuse panel if possible.
- d) Keep clothes, cords, and loose objects away from moving parts. They can get caught in the equipment causing injury to yourself and possibly others.
- e) Never remove guards of safety devices from any machine. They must always be in place when the tool is being used. If for any reason a safety guard is removed, or if the machine is defective in anyway, the machine must not be used until proper authorities make corrections.
- f) The student operating any electrical equipment is called the "operator". Only the operator can start and stop the equipment.
- g) Check all adjustments before turning on the power. Verify that all adjustments are locked into place before starting a piece of equipment. Vibration may cause an adjustment to loosen, slip, or change position. Vibration may cause tools or other loose objects to be drawn into the moving parts, causing personal injury and damage to the equipment.
- h) Do not in any way distract the operator of a machine. If you start a machine, stay with it until the machine is turned off. Never leave a

machine running while you go away from it. Use caution when approaching power machines. Stay away from moving parts. Never stand in the direct line or “throw” of any machine. If a machine breaks or becomes overloaded, objects can be thrown out with strong force (the stock could not be held securely or knots/slivers can break loose).

## **10) GENERAL WELDING SAFETY PRACTICES**

- a) Obtain the instructor's permission before using welding equipment.
- b) Report immediately to the instructor any unusual heating or smoking of equipment.
- c) Work with adequate ventilation and avoid creating excessive fumes.
- d) Keep all flammable materials away from the welding area.
- e) Ear protection should be worn in any area where noise is created from grinding, welding, or other repair procedures.
- f) Do not perform any welding operations on a wet floor to avoid sputtering and exploding of molten metals.
- g) Do not attempt to weld material when it is on concrete. This practice may cause an explosion.
- h) Do not weld cans or tanks that have contained gasoline, oil, or other flammable liquids.
- i) Report any leaking cylinders or containers.
- j) Wear a suitable face shield while operating welding equipment or while watching the welding flame. Wear proper goggles or helmet when welding or watching the operation.
- k) Prepare and use your own station.
- l) Do not exchange tools and accessories with other students. Turn off flame at all times when you are not actually welding.
- m) Sparks dropping in the ear may cause a serious burn or even cause an ear drum puncture. Put cotton in your ears, use earplugs, or pull a cap down over the ears when welding overhead.
- n) Oil and grease will ignite violently in the presence of oxygen under high pressure. It is important to keep hands, equipment, and fittings free of these substances.
- o) Watch the hose. Do not allow hot metal or heavy pieces, which might cause burns or bruises to fall on it.
- p) Grinders made for and used on ferrous materials should not be used on non-ferrous materials. Non-ferrous materials will clog up the wheel, which will build up heat in the wheel that could explode.

## **11) OXYGEN-ACETYLENE WELDING**

- a) Avoid rough handling, dropping, or knocking over cylinders. Rough treatment of an acetylene cylinder may damage the fuse plugs or the valve and cause the gas to escape. Keep cylinders from being knocked over while in use. Use a suitable truck, chain or other locking device.

- b) Close the cylinder valve when you have finished, and open the torch valve in order to relieve all pressure in the regulator and hose line.
- c) Never use valve-protection caps for lifting cylinders from one vertical position to another. Valve protection caps are designed to protect valves from being damaged.
- d) Cylinders must never be used as rollers or support for material or machinery, even if they are considered to be empty. The gas in the cylinders is under very high pressure. Do not allow cylinders to come into contact with live wires or ground wires from electrical equipment.
- e) Acetylene is a fuel gas. Keep cylinders far enough away from the welding or cutting work so that sparks, hot slag, or flame will not reach them. Never allow cylinders to come into contact with live wires, third rails, or ground wires from electrical equipment. Never open an acetylene cylinder valve near other welding or cutting work, or near sparks, flame or any other possible source of ignition.
- f) Be thoroughly acquainted with the purpose, characteristics, and dangers of oxygen. Oxygen is to be called "oxygen," air is to be called "air," and acetylene is to be called "acetylene" when calling for or speaking about the various gasses. Never use oxygen in place of compressed air and do not confuse the two. Be thoroughly acquainted with the characteristics and dangers of oxygen. Oxygen or acetylene should never be used as a pressure supply; do not use to blow out oil lines, gasoline lines or gas tanks. Oxygen should never be allowed to saturate any part of the clothing because the spark might quickly start a fire.
- g) Regulators should always be attached to cylinder tanks to maintain a safe, constant working pressure. Oxygen and acetylene regulators must not be interchanged.
- h) Release the pressure adjusting screw on the regulators before opening the cylinder valve.
- i) Never use more than 15 pounds pressure on the line gauge of an acetylene regulator. When opening cylinder valves, do not open suddenly as the pressure gauge might explode. Stand to one side of and away from gauge faces and front of the regulator.
- j) Close cylinder valves when work is finished, and open the torch valve briefly in order to relieve all pressure in the regulator and hose line; then close the blow pipe valve. Always close valves of empty cylinders in storage to prevent waste and fire hazards.
- k) You may only open an acetylene tank valve a maximum of 3/4 of a turn.
- l) The T-wrench must be left in place on the valve while the cylinder is in use so that the acetylene can be turned off quickly in case of emergency. Also, keep the space between the cylinder and the job clear so that you can reach the valve quickly in case of an emergency.
- m) Never attempt to repair oxygen or acetylene cylinder valves.
- n) Use soapy water to test for leaks around cylinder valves or fittings of equipment. Under no circumstances should you use a lighted match.

- o) Do not allow hot or heavy pieces of metal that might cause cuts or bruises to fall on the hose.
- p) Make sure hoses are free from dirt before attaching the torch. Do not apply too much pressure in hooking up a torch. The acetylene hose connection has a left-hand thread. Light the torch with a friction lighter.
- q) Always use the correct amount of gas for a given size-welding tip. Cutting down the size of the flame will cause popping of the flame and scattering of hot metal. Close torch valves quickly in case of flashbacks.
- r) Be certain there is no oil, grease, or petroleum-based products in the presence of oxygen under pressure. Oil and grease may ignite violently in the presence of oxygen under high pressure.

## **12) ARC WELDING SAFETY**

- a) Arc weld only in a screened or enclosed, force-ventilated area.
- b) Be sure that screens, curtains, or other protective devices have been set up or drawn tight so that only students wearing a protective shield can see the arc flash. Protect your face and eyes with goggles or a flip-front helmet when chipping slag from welds.
- c) Never look at the arc without the proper filtered lens. One direct flash is sufficient to produce a headache or sore eyes.
- d) Wear an arc welding helmet with the proper lens, treated gauntlet gloves, and treated leather apron as protection against ultraviolet and infrared rays, flames, and hot metal. Make certain that the shield does not have any openings.
- e) Keep sleeves and pant cuffs rolled down and collar buttoned to prevent sparks from directly contacting skin. Be sure that the tops of shoes are covered.
- f) Keep all flammable materials off the welding table and away from the immediate welding area. Secure electrical contacts and grounds to prevent fire and burns. Report to the instructor at once if the electrode holder, cable connections, cable terminals at the welding machine, ground clamp, lugs, or cable gets hot.
- g) Do not let the cable touch hot metal. Use tongs, vice grips, pliers, channel locks, etc, when quenching heated metal. Label heated metal "HOT" when it is left unattended to warn other students.
- h) Keep electrode stubs off the floor since the round shape can cause a slip or fall.
- i) Avoid unnecessary inhalation of fumes while welding galvanized steel, phosphor, bronze, and stainless steel.
- j) Never weld on a closed container of any kind until it has been thoroughly cleaned and properly tested as protection against an explosion.
- k) Shut off the welder when work is finished. This is a protection against sustained short circuits.
- l) When work is completed, suspend the electrode holder in a manner that will protect it from touching any metal that could ground it.
- m) Before starting to weld, be sure the work is well grounded.

### **13) SPOT WELDING SAFETY**

- a) Wear a face shield or goggles as protection from flying sparks and molten metal.
- b) Be sure that other persons nearby are protected from flying sparks.
- c) Wear suitable leather gloves while operating a spot welder.
- d) Prevent excessive explosion by proper preparation of work and correct setup and operation of the spot welder.
- e) Do not rub your fingers across completed spot welds. The welds may be hot or jagged.
- f) Prevent burns by not touching the work or the part of the machine that has become heated during the welding operation.
- g) Do not bring the electrodes together unless a piece of stock is between them.
- h) Shut off the spot welder as soon as all work is completed.

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